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ENGINEERING AND MINING JOURNAL

A Weekly Journal of the Mining and Mineral Industries

March 4, 1922

Engineering and Mining Journal
and the
Mining and Scientific Press
will be consolidated
April 1
as the
ENGINEERING & MINING
JOURNAL-PRESS

See first reading page for detailed announcement

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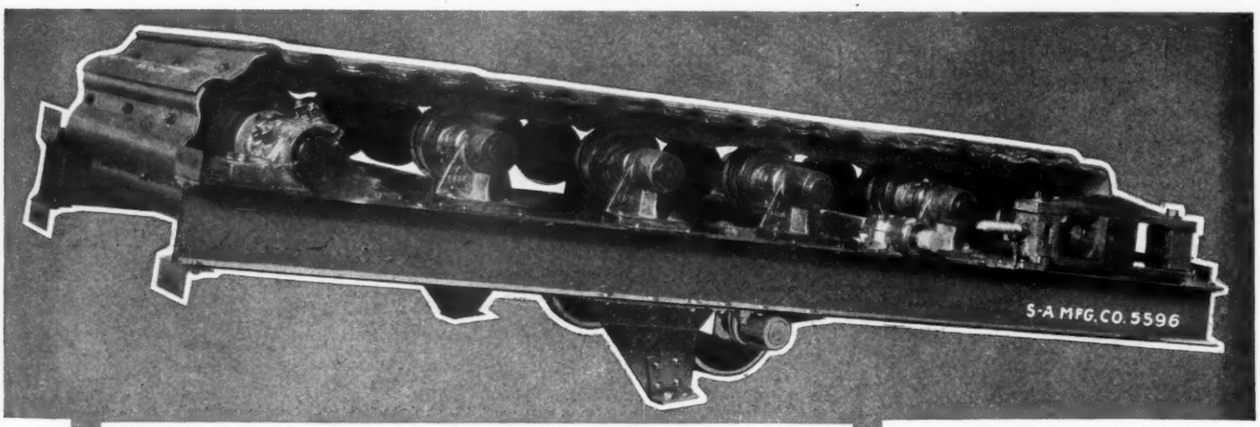

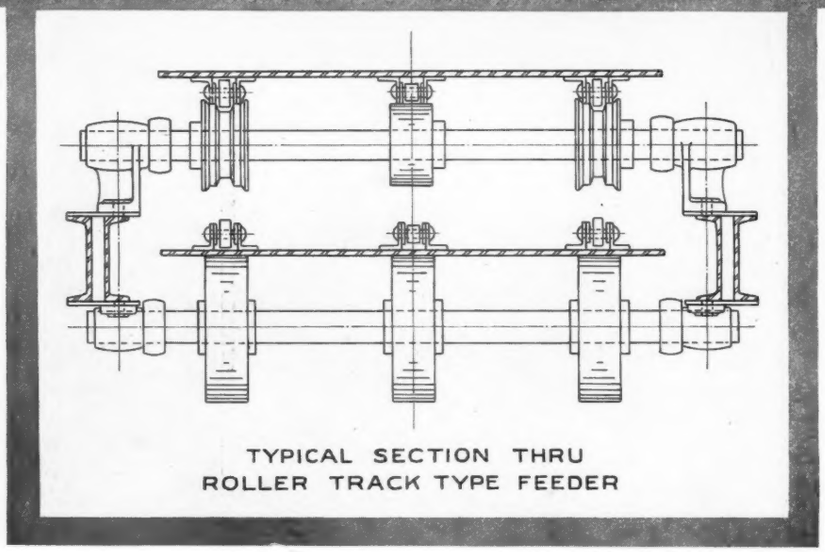

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Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries
METALS NON-METALS PETROLEUM

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Volume 113 **New York, March 4, 1922** *Number* 9

Union of the Two Great Weeklies of the Mining and Mineral Industries

THIS IS AN ERA of growth, development, and organization, and the mining industries of the country and of the world are not exceptions to the general evolution, but indeed are typical examples. The all-'round mining engineers of a few decades ago have resolved themselves into a group of specialists, each devoting himself to the science of one of the many branches of mining or of treating ores, or to some one of the increasingly precise economic phases of mining. Each mining industry is progressively developing its own technique, its own economic requirements, its own particular place in the complex of present-day life. A mining journal, therefore, to keep ahead of the times must also be constantly progressive and must grow.

IT IS with the desire to serve more effectively these growing complex industries that there has been agreed upon a union of forces between the two great mining weeklies of the country and of the world, *Engineering and Mining Journal* and the *Mining and Scientific Press*. Both have international influence; neither represents a section. The strength of *Engineering and Mining Journal* is great in the Western States; *Mining and Scientific Press* is well known and influential in the East. Each is long established and successful, the former having been founded in 1866, the latter six years before, in 1860. But at those dates the West Coast was remote from the East, and independent centers of scientific and technical thought naturally arose. These conditions have progressively altered to the vanishing point.

Development and increase of population have blended the East and West; and the building up of the mining activities in the vast intervening territory has joined them in one great whole.

UNDER recent conditions neither journal can go confidently forward in a progressive expansion. The development of mining more and more clearly indicates the conclusion that there is room and need for only one really great mining journal, not only for the country, but for the world, which also is daily being knit more closely together.

THE combined journals will be published under the name of *Engineering and Mining Journal-Press,* with Mr. J. E. Spurr as Editor. Mr. T. A. Rickard becomes Contributing Editor. Mr. Rickard will remain on the Coast and will especially present the problems and the voice of the West. It is intended that increased attention shall be given in the new journal to all the features which have been carefully worked out editorially for the two weeklies, and, in addition, it is intended to devote increased attention to the important and

growing field of non-metallic mining. With a large and additional force, a campaign of increased field work on the part of the editors will also be made possible by the consolidation. Better correspondence, including better European representation, has been arranged for. *Engineering and Mining Journal-Press* will serve the entire mining industry, including the Far West, as never before, with this consolidation of resources and editorial staff.

THE subscription price of *Engineering and Mining Journal* has been five dollars; that of the *Mining and Scientific Press,* four dollars. The price of the *Engineering and Mining Journal-Press* will be four dollars.

THE consolidated weekly will have far greater circulation than any other mining journal in the world. Both the journals which are now combined have had an international circulation—in the case of *Engineering and Mining Journal* one out of every four subscribers is outside of the United States.

WE KNOW that the consolidation will be a most popular one, and that it will be hailed by readers and advertisers alike as a practical example of the "elimination of waste" in mining industries. The consolidated journal will afford the editors and publishers an opportunity never before approached for service to the mining industries.

McGraw-Hill Company, Inc., JAMES H. McGRAW, *President.*

WHAT OTHERS THINK

Graduates of California, Stand Up!

On Jan. 7, 1922, the *Engineering and Mining Journal* contained a write-up of the College of Mining, University of California, by your Western editor, Mr. George J. Young: an interesting article in some ways because three columns of the text is devoted to inconsequential gossip suggested by the author's "scrap-book of allusions" or illusions, irrelevant in regard to the College of Mining; incompetent and misleading in other ways, because of inaccuracy and omission of essential facts. I have a high regard for your Western associate; his sketch is breezy and tends to revive that "slow decadence of American humor" which President Barrows is said to deplore; he does his job as a magazine reporter, and having once been on the teaching staff of three mining colleges, Nevada, Minnesota, and Colorado, and an alumnus of the University of California, his evaluation of the merits of a curriculum should carry weight.

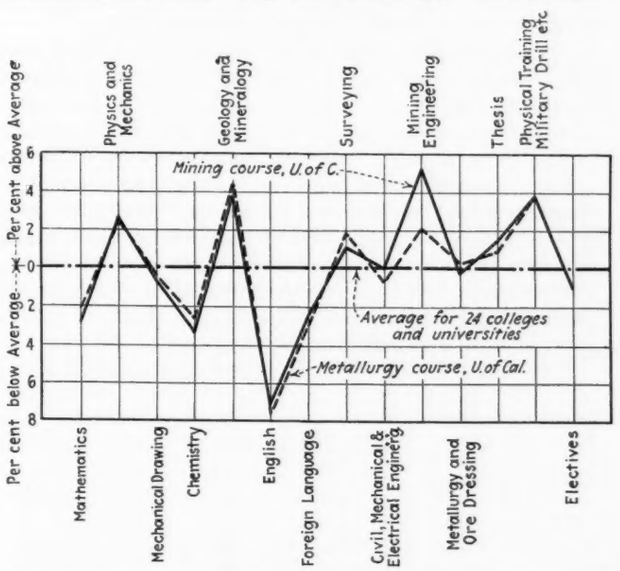
In August, 1921, Mr. Young called at my office and consumed all of fifteen minutes in asking a few questions. I had just completed a statistical summary of the enrollment for the semester and gave him a copy. He told me he intended writing "something" about the College of Mining, and in this respect he has kept his word. I plead for accuracy of statement and the good name of California. Such faulty effusions are harmful in many ways, they are unjust to the University, they cause bewilderment in the minds of students, and make the older men of the profession who take pride in the *Journal* and who look to its pages for information and inspiration hesitate and question the reliance that can be placed in other articles published in its pages.

How puny and puerile is the Young statement as compared with the competent analysis and constructive report of the Committee on Technical Education of the Mining and Metallurgical Society of America, which calls attention to the diversity of opinion on what constitutes an acceptable course of studies for students of mining engineering. The education of an engineer is never completed, and no school or college, whether it prescribes a four-, five-, or six-year course, can turn out a finished product. It teaches an alphabet that the student may learn to spell; it supplies tools with which to work; it develops an inquiring mind, quickens observational and inferential powers, and stimulates the desire for knowledge, for truth, and accomplishment. No college can graduate a man capable of immediately assuming the direction of a mining enterprise: men are not born; they grow and develop, and all children creep before they walk. An engineering college lays only a foundation on which the superstructure shall be built in the great laboratories of the world.

I desire to correct some of the false statements and implications made in your issue of Jan. 7. A prospective student to the University of California must either pass rigid entrance examinations or be fully matriculated from an accredited high school. He enters an engineering college with a comprehensive understanding of mathematics above that required by many other universities. A searching test in English is prescribed for all intrants, and failure means a protracted course, without credit, in English composition, until the student can satisfy this requirement. Throughout the undergraduate days, all examination papers and other tests are blue pencilled for irregular orthography, calligraphy, and composition. Repeated offences may lead to further corrective courses. In all upper division work, so far as time will permit, the historical background of the subject is presented, the business and humanistic side of mining is particularly emphasized, its influence in the march of civilization, and its relationship to

other industries. Throughout the course, and more than ever in the senior year, the economic side overshadows the merely technical or mechanical. A blacksmith is best trained in a smithy, a "mucker" in the stope, a rodman in the field. It is apparent to me that what was "not apparent" and "also not apparent" to Mr. Young might have been apparent to the gentleman had he the "vision, capacity, and personal power" that comes from the "quiz method" which he preached but apparently does not practice.

Figures will or will not lie, as we interpret them. The arithmetical gymnastics presented by Mr. Young are fittingly framed in the empty three rings of his Fig. 2. Again I say that enlightenment would have followed inquiry. An engineer should not jump at conclusions. In addition to the actual lectures and laboratory work in college halls, problem sets, assigned reading, Saturday field trips, and a month's geology excursion, at least one summer in mine, mill, smelter, or oil field is required of all students; record is kept, reports are criticised, and credit is given accordingly. Every candi-



COMPARISON OF SUBJECT REQUIREMENTS IN MINING AND METALLURGY CURRICULA

date for the B. S. degree must present a thesis based either on field studies or laboratory experimentation. As this is the culminating feature of the rigidly prescribed course, work of a high order is expected. These are not "theoretical requirements." My deep concern for the students is in the limitation of "play time" rather than its excess. About 50 per cent of the student body is wholly or in part "working its way" in order to pay for the much-desired education.

In *"Bulletin 150,"* Mining and Metallurgical Society of America, tables 1 and 2 show the distribution of students' time in a four-year course of mining and metallurgy respectively at twenty-four universities of the United States. Using the average of all colleges as a datum line, I have prepared a chart showing wherein the courses as given at California depart from this established average. It should be noted that in the tabulations given a unit of laboratory work is taken as meaning two hours, whereas at California all laboratory courses are of three hours' duration.

In conclusion, a word about the fitness of our graduates for life work: In 1917 and 1918 practically the whole graduating class passed immediately from the campus to the United States Army or Navy as commissioned officers to serve in the Great War. Yes, I think they could "qualify as an assistant to a draftsman," but there are bigger things for them to do. At California it is seldom that an engineering student is considered for Phi Beta Kappa: during the last three years two mining students have been elected. Twenty-two men have made Tau Beta Pi in five years; ten men were honored by Sigma Xi. Last year eight miners made the Big "C"; in 1920 and 1921 the captain of the crew was a mining student. In 1920, when the University medallist was chosen, it was found that of the first twenty scholars in a student body of 11,000, four were registered in an engineering college. Such a record demands more than "passive receptivity."

In August, 1921, there were transfers to the College of Mining, University of California, from twenty different universities for upper division work, from Yale westward. Three men are working for a higher degree in the graduate school.

California is rightly proud of its alumni. Gardner F. Williams, Alpheus Williams, W. W. Mein, C. W. Merrill, E. L. Oliver, F. L. Ransome, C. B. Lakenan, S. A. Easton, F. W. Bradley, P. R. Bradley, B. H. Dunshee, F. W. Laist, C. W. Butters, F. G. Cottrell, Norman Stines, D. McLoughlin, Fred Searles, Erle Daveler, B. L. Thane are names to conjure with. These, and many others, are they who, possibly in spite of the fact that "many subjects are lacking in this engineering course," have eventually landed "in the higher consulting and operating positions." No, "the students of marked ability are not going to be miners"; they are diligently preparing themselves to take their place in the development and direction of the mineral industry, as men and as citizens of this great state and country.

Berkeley, Cal. FRANK H. PROBERT,
Dean, College of Mining, University of California.

African Golf in India

White people in the East are all classed as "Europeans," for it is only recently that Americans in any numbers have begun to appear in the Far East. In Jamshedpur, India, where the big steel works of the Tata Iron & Steel Co., Ltd., are situated, many Americans are employed, and some years ago Sam Washington, a southern darky, blew in, who claimed Birmingham, Ala., as his home town. Sam was a distinct curiosity in every way to the country, and on appealing to some "white folks" was given a job firing on a switch engine, where he did good work in the hot climate. On pay day, with his silver rupees jingling in his pockets, Sam viewed the hundreds of his unsuspecting, brown-skinned fellow employees with anticipated joy. He soon managed to corral several of them in a secluded corner, and producing two little cubes of ivory proceeded to institute an orgy of Dixie's national game. Three times Sam "shook 'em, talked to 'em and rolled 'em," but not the faintest gleam of intelligence appeared in the cow-like eyes of his audience, who merely gazed at him questioningly. Sam, disgusted, tried a new bunch, and then another, only to achieve the same result.

At dusk Sam stood leaning against a tree, a picture of despondency, trying to puzzle out the strange phenomenon, when one of his white foremen strolled along, and Sam gave vent to his solution of the mystery as follows: "Captain! Dese heah niggers hain't got any brains and sense like us Europeans, has dey?"

The Westly Electric Furnace for Copper Smelting

Experiments Made at Sulitjelma, in Norway, Show Electric Smelting Practicable Where the Necessary Power Is Available at Low Cost—Metallurgical Advantages Include Sulphur Conservation, Reduced Metal Loss, and Smaller Flux Requirements

BY C. S. WITHERELL AND H. E. SKOUGOR
Written for *Engineering and Mining Journal*

AS IN THE METALLURGY OF IRON, a great deal of thought and experimentation have been given to the electric smelting of non-ferrous ores, with the hope of obtaining lower costs and better metallurgical efficiency. It is natural that the most practical developments in electric smelting should have taken place in Norway, where electric power is cheap, fuel expensive, and ore available. During the war period there was also the added incentive of high prices and great demand for all metals.

During the summer of 1912, Jens Westly, metallurgical engineer of the Sulitjelma Copper Co., of Norway, conducted the first practical experiments with his new electric smelting process. Ore from the Vaer Valley containing copper and nickel was treated, together with Elmore concentrate from Sulitjelma. Since then the Westly electric smelting process has been gradually developed until it has been applied to regular large-scale operation at Sulitjelma.

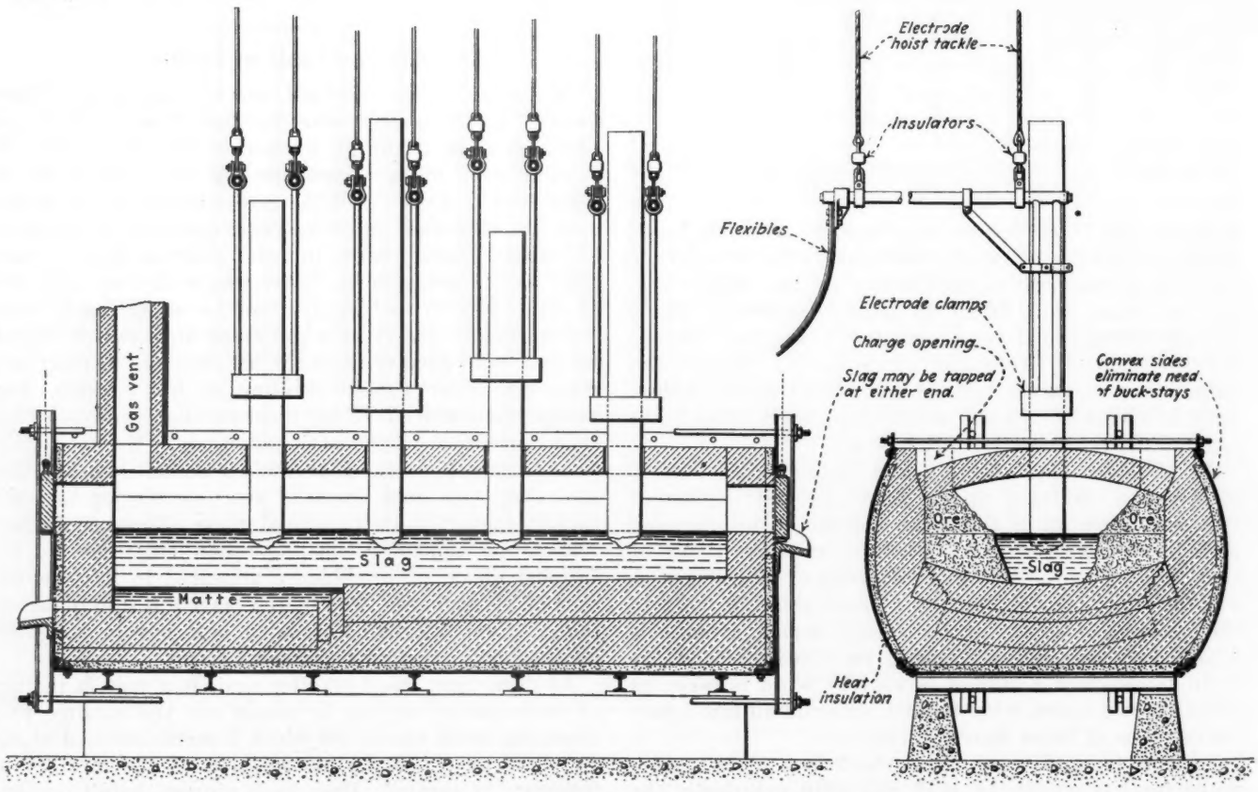
The Westly electric furnace developed for the process is of simple design and construction. It consists of a boiler-iron shell, lined with standard refractories, an open arched roof with regular electrode openings, and holes along the skewbacks for charging. The electrodes are fed vertically through the top. At first, single-phase alternating current and two electrodes were used in the furnace. Later, three-phase alternating current, with three, and up to six, electrodes, according to the size of the furnace, were also used. Preferably, the electrodes are placed in a straight line, although the delta arrangement has been used.

As can be seen in the illustrations, the furnaces at Sulitjelma were non-tilting. Ordinarily, there would be no reason for tilting in straight smelting, but the furnace can be made tilting if desired.

The design and construction do not differ much from the Heroult smelting furnace, but some important operating details are peculiar to the Westly furnace.

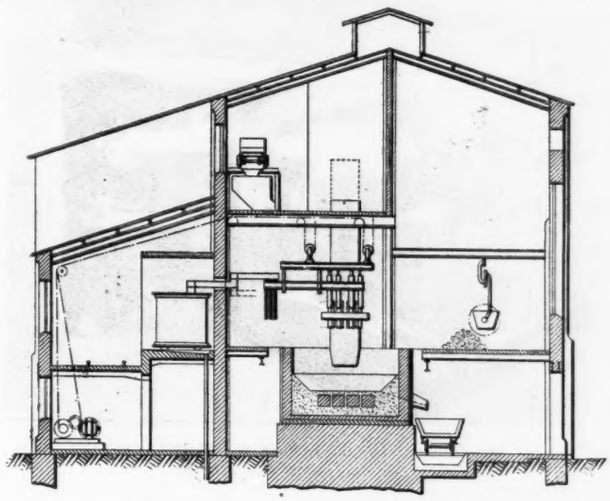
A transverse section of a Westly furnace is similar to that of a modern smelting reverberatory. The ore, charged through roof openings along the skewbacks, banks against the sides and forms, as it melts, a molten pool in the center composed of slag and settling matte. A sump is incorporated in the hearth of the furnace, preferably at one end, for the purpose of diverting the settled matte away from the electrode tips and also to provide a larger bulk for tapping.

The electrode tips dip into the slag layer, but are



DIAGRAMMATIC SKETCH OF WESTLY ELECTRIC SMELTING FURNACE IN OPERATION

kept a considerable distance above the matte layer; hence the heating is done entirely by the current passing through the slag between electrode tips, it being intended that the matte layer should carry practically no current. This takes advantage of the fact that all mineral substances that are electric insulators when



A CROSS SECTION OF A SMELTER BUILDING WITH OPERATING PLATFORM FOR THE MAKING IN PLACE OF CARBON ELECTRODES

cold become high-resistance conductors when above a red heat. There is no arc action when the furnace is running normally, and as a result the power factor is almost unity.

The experimental and developmental work done at Sulitjelma was thorough, covering several sizes of furnaces, from 200 kw. to 900 kw., and furnaces of various shapes. Also, the method of operating was varied to obtain complete operating data. Because of the success of the initiatory tests, the Sulitjelma company undertook to build a 3,000-kw. furnace, which was almost completed before plant operation was stopped at the end of the war. This furnace should be able when efficiently operated to smelt at least 100 metric tons of charge per day.

The principal ore treated at Sulitjelma consisted of mixed sulphides; namely, copper pyrite, iron pyrite, and pyrrhotite, in a gangue of gabbro and phyllitic slate. The mined ore was partly concentrated, which gave a product for smelting, analyzing on the average 6 per cent Cu, 28 to 30 per cent S, and 28 per cent SiO_2. Usually, part of this concentrate was roasted and mixed with the raw portion before charging into the electric furnace, thereby producing 30 to 40 per cent copper matte direct. The slag usually ran 0.3 to 0.4 per cent Cu. No fuel was added with the charge nor used extraneously. The slag loss was cut from 10 to 20 per cent in previous methods to 5 to 6 per cent in the electric method. Also, the slag could be varied considerably in composition; successful slags analyzing up to 62 per cent SiO_2 were run.

POWER CONSUMPTION MODERATE

Electric-power consumption in regular operation was less than 700 kw.-hr. per metric ton of ore smelted. The furnace voltage varied from 112 to 230 volts, depending on the space between electrodes and resistivity of the molten slag; the more siliceous the slag, the higher the resistivity. The electric current used was three-phase, fifty-cycle.

The consumption of electrodes for regular smelting amounted to 3 to 4 kg. of carbon electrode material per metric ton of ore smelted.

Two long and several short campaigns were made. One furnace ran continuously at 600 kw. for 378 days and was finally shut down on account of labor trouble; another furnace ran 186 days at 300 kw., with one stop to make changes in the transformer station, and finally shut down to transfer its transformer to the first furnace, thus bringing the power of the first furnace up to 900 kw. This 900-kw. furnace ran for about four

RECORDS OF EXPERIMENTAL AND ROUTINE OPERATION OF WESTLY ELECTRIC FURNACES AT SULITJELMA, NORWAY, FOR 1917, 1918, 1919

	Elmore Raw	Conc. Roast	Silica Flux	Crushed Slag	Total Solids	Liquid: Knudsen Furnace	Liquid: Conv'r	Total Liquids and Solids	Kw.-Hr.	Kg. Per Kw.-Hr.: Solid	Kg. Per Kw.-Hr.: Total	Smelting Days: Furnace No. 1	Smelting Days: Furnace No. 2	Per Cent Cu: Furnace No. 1 Matte	Per Cent Cu: Furnace No. 1 Slag	Per Cent Cu: Furnace No. 2 Matte	Per Cent Cu: Furnace No. 2 Slag
1917																	
January	5	70	...	...	75	33	9	117	86,200	0.87	1.36	7	..	22.8	0.60	....	....
February	93	291	...	...	384	272	85	741	354,900	1.16	2.09	28	..	28.4	0.53	....	....
March	170	257	18	20	465	469	146	1,080	396,400	1.17	2.72	31	..	24.4	0.40	....	....
April	30	17	5	...	52	55	17	124	47,650	1.09	2.60	4	..	25.5	0.38	....	....
May	143	202	25	...	370	268	73	711	287,900	1.29	2.47	16	13	24.3	0.31	19.6	0.32
June	153	488	27	...	668	390	182	1,240	592,800	1.13	2.09	30	30	26.2	0.55	23.3	0.56
July	317	324	31	...	672	545	217	1,434	623,700	1.08	2.30	31	31	26.3	0.46	20.6	0.53
August	423	209	3	...	635	420	208	1,263	588,800	1.08	2.15	31	31	23.4	0.45	19.4	0.57
September	226	235	...	...	461	302	230	993	428,000	1.08	2.32	30	10	23.8	0.45	19.4	0.55
October	171	356	...	...	527	365	254	1,146	539,500	0.98	2.12	31	31	19.9	0.56	19.6	0.53
November	217	104	...	...	321	600	229	1,150	450,100	0.71	2.55	30	20	31.0	0.73	25.3	0.74
December	191	194	...	251	636	433	203	1,272	491,250	1.29	2.59	31 (a)	..	33.0	0.52	....	....
Total for 1917	2,139	2,747	109	271	5,266	4,152	1,853	11,271	4,887,200	1.08	2.31	300	166	26.04	0.50	21.1	0.57
1918																	
January	157	166	...	586	909	246	192	1,347	536,650	1.69	2.51	31	..	34.4	0.75	....	....
February	193	241	...	346	780	432	219	1,431	506,700	1.54	2.82	28	..	30.2	0.70	....	....
March	246	383	...	...	629	516	217	1,362	536,700	1.17	2.54	28	..	29.5	0.62	....	....
April	163	287	87	...	537	461	207	1,205	498,600	1.08	2.42	25	..	31.44	0.56	....	....
May	181	351	38	...	570	237	190	997	520,800	1.09	1.91	25	..	30.25	0.60	....	....
June	96	458	50	...	604	75	185	864	491,700	1.23	1.76	30	..	24.50	0.51	....	....
July	220	439	1	...	660	232	126	1,018	575,700	1.15	1.77	31	..	27.0	0.64	....	....
August	316	514	20	...	850	42	143	1,035	599,500	1.42	1.73	31	..	22.70	0.64	....	....
September	123	177	64	...	364	150	201	715	266,430	1.37	2.68	8	21	27.80	0.56	13.35	0.43
October	122	18	...	...	140	.....	165	305	132,880	1.05	2.30	...	24	.....	....	14.40	0.41
November	...	...	...	...	...	.....	...	...	...	...	...	...	...	.....	....	....	....
December	...	153	...	...	153	6	211	370	151,930	1.01	2.44	...	29	.....	....	18.7	0.48
Total for 1918	1,817	3,187	260	932	6,196	2,397	2,056	10,649	4,817,590	1.29	2.21	237	74	28.60	0.62	15.79	0.44
1919																	
January	126	65	...	...	191	12	223	426	188,020	1.02	2.27	2	30	19.80	0.56	15.60	0.52
February	90	481	42	...	613	.....	161	774	404,100	1.52	1.91	21	..	20.70	0.53	....	....
Total for 1919	216	546	42	...	804	12	384	1,200	592,120	1.36	2.03	23	30	20.62	0.53	15.60	0.52

Note: This record is not entirely conclusive, as it indicates poor results together with good ones, and experimental as well as routine operations.
(a) Of this twenty-one days with about 1,000 kva.

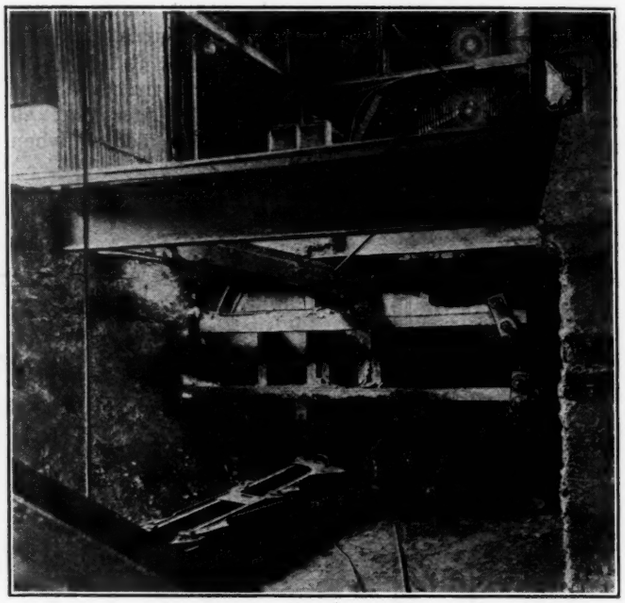
months. The whole plant was finally shut down on account of the poor copper market following the war. Thus it can be seen that long campaigns can be expected, and because of the simplicity of construction and relatively small size of an electric furnace compared with other smelting furnaces, lost time for repairs will be small and the repairs will be cheap and easy to make.

Electric Method Suitable for Low-Sulphur Ores

The electric method of smelting is particularly applicable where it is desired to conserve sulphur. The little sulphur loss that does occur is either by distillation of part of the "first atom" or by reaction with oxides in the ore. As the electric-furnace atmosphere is either neutral or reducing, the principal cause of sulphur loss, namely oxidation, that obtains in other kinds of smelting furnaces is eliminated. Furthermore, when smelting a raw sulphide ore, the electrode consumption will be less than with roasted ore, and therefore, under such condition, a saving can be expected on the 3 to 4 kg. per metric ton experienced at Sulitjelma. However, the main conditions that govern the choice of the electric method in preference to a fuel method of smelting are low power cost and high fuel cost.

Operating Cost Comparisons

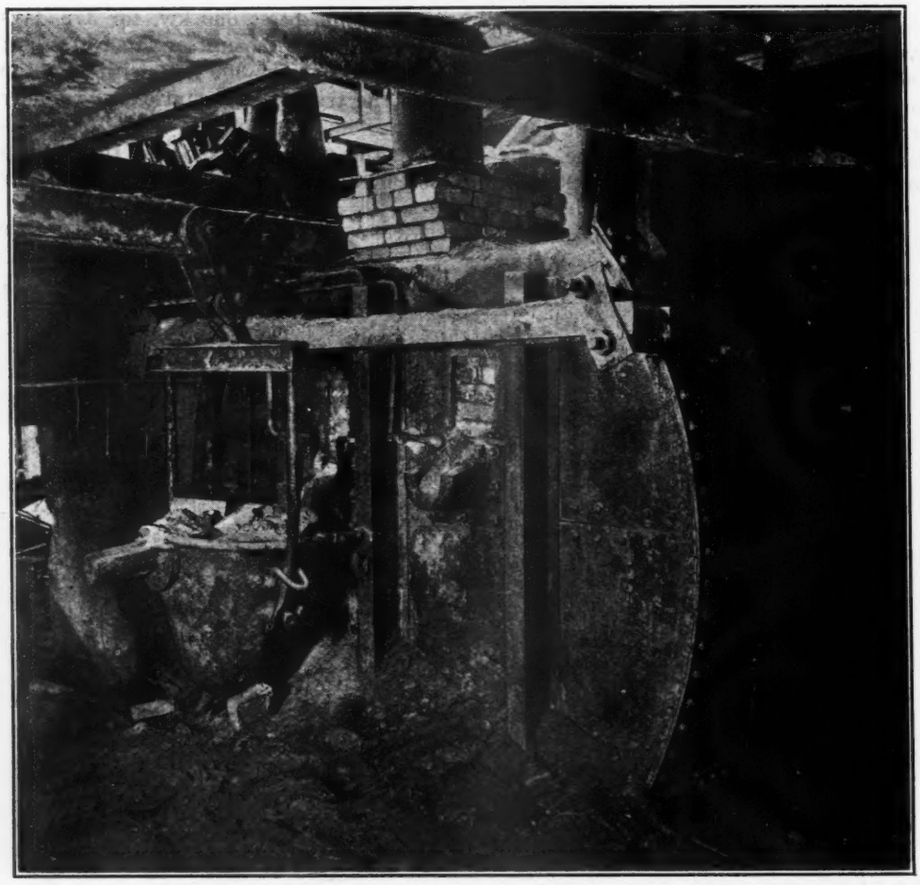
In comparing the operating cost of the electric method with that of fuel methods, it is only necessary to consider the items affected, to arrive at a conclusion as to probable economy. The following is a tabulation of such items, comparing the electric method with blast-furnace smelting and also with reverberatory smelting:



MATTE END OF 1,000-KW. FURNACE
(d) Stack. (e) Matte launder

BASIS OF COMPARISON OF VARIOUS METHODS OF SMELTING

Item	Electric Method	Blast-Furnace Smelting	Reverberatory Smelting
A...	Electric power	Coke	Fuel
	Electrode consumption	Agglomeration of fines	.....
B...	Slag loss	Slag loss	Slag loss
	Dust loss	Dust loss	Dust loss
C...	Operating labor	Operating labor	Operating labor
	Upkeep	Upkeep	Upkeep
D...	Interest on investment	Interest on investment	Interest on investment
	Obsolescence	Obsolescence	Obsolesence



SLAG END OF 1,000-KW. FURNACE
(f) Slag pot. (g) Slag launder

Item "A" is the most important and the first that should be considered, as it contains the controlling conditions for the choice of the electric method—namely, cheap power and expensive fuel. Such conditions are found in mineralized localities, remotely situated, causing high freight rates, and where either hydroelectric power is available or cheap to install, or power can be obtained over a high-tension line from a cheap source, either steam or hydro-electric. By cheap power is meant, say, not over $60 per kw.-yr., delivered to the high-tension side of furnace transformers. Blast-furnace coke that would cost only $6 or $7 per ton at any of the great metallurgical centers of the United States costs over $20 in many remote places. This applies also to coal or fuel oil for reverberatory smelting. Carbon electrodes 12 to 20 in. in diameter, tapped for splicing nipples, now cost 6 to 7c. per lb. in the eastern centers of the United States, but would probably cost 9c.

per lb. in places where the electric method would be used. As no form of agglomeration of fines (such as sintering or nodulizing) is needed for electric smelting, this would constitute a gain over the usual blast-furnace operation or practice.

Item "B" is of next importance. Metallurgical loss in smelting is mainly made up of slag and dust losses. Undoubtedly, as borne out by Sulitjelma experience, the electric method will produce slags running much lower in metal content than the slags produced by fuel methods operating on a charge of like composition. This is due to the thorough, quiet settling at a perfectly controlled temperature. As ordinarily there are no combustion gases to be considered in the operation of the Westly electric furnace, or at the most only a little gas produced by occluded air in the charge and from sulphur reactions, practically no dust is thrown off from the furnace, thus eliminating the second main cause of metallurgical loss even with most up-to-date dust-catching devices.

CHARGE FLOOR OF 1,000-KW. FURNACE

(a) Electrodes (suspension omitted). (b) Charge openings (on both sides of electrodes). (c) Charge bin (one at each end of the furnace), one containing raw, and the other roasted, ore. (d) Stack.

It is difficult to forecast just how much the metallurgical loss will be lessened, but for most smelting plants a fair figure for the reduction of total loss would be, say, from 12 lb. copper per short ton of charge in fuel smelting down to 6 lb. per short ton in the electric method, or, probably, a saving of 6.6 lb. of copper per metric ton smelted. Assuming a value of copper at this stage of the process at 10c. per lb., a saving of $0.66 per metric ton of charge is effected. If precious metals are present, the saving will be still greater.

Slag Range Wide in Electric Smelting

In fuel smelting (blast-furnace or reverberatory), the slag must be kept within certain limits of composition to produce good metallurgical results. This frequently requires an addition of a flux or a low-margin ore whose metal value would hardly cover its smelting cost. As before stated, the electric method can handle a much greater range of charge composition, owing to the unlimited but perfectly controllable temperature, and therefore few ores would require flux in the electric furnace. A highly siliceous or aluminous slag that would be considered impossible for fuel smelting can be successfully run from the Westly electric furnace, and although it may analyze a little higher in copper, because of the lesser amount of slag produced, the slag loss per ton of ore charged would be less than when using fluxes.

Considering item "C," smaller units, ordinarily (100 to 300 tons per day), would be used with the electric furnace than with fuel furnaces (over 500 tons per day), and hence the operating labor cost would be slightly higher in electric smelting, but this would be offset by cheaper upkeep.

The amount of furnace repairs at Sulitjelma was found to be very low, the reason for which is apparent when the method of heating is considered. In a fuel-heated furnace, the heat is generated away from the ore or slag and must be transmitted to the ore or slag by conduction or reverberation. The inside surfaces of the furnace are subjected to higher temperatures than those existing in the material treated. In the electric furnace the heat is generated in the slag layer, and as the inside surfaces of the furnaces are heated only by contact or radiation from the molten bath, they must be at a considerably lower temperature than the bath. Furthermore, the quiet atmosphere of the electric furnace is not conducive to the excessive erosion that exists in fuel furnaces.

As to item "D," it is not expected that the capitalization costs of the Westly electric furnace plant would be any greater than those of fuel smelting plants. The furnace proper, on account of the simple design and lack of massive parts, would cost less per ton of capacity than either a blast furnace or a reverberatory. The electric equipment would be somewhat expensive, but this is at least partly offset by auxiliaries for fuel furnaces, such as blowers, fuel pulverizers or fuel-oil storage and atomizers, dust-catching devices, and other necessities. As the investment is about the same, interest charges will be approximately equal.

In considering obsolescence, it is usual to assume a shorter period in which a new style of device will become obsolete than for an old-style standard device, say five to seven years against seven to fifteen years. But under the metallurgical conditions that an electric furnace would be used, the furnace would be superseded by another electric furnace of better or larger design and a blast furnace or reverberatory would have to be scrapped before the termination of its natural life. In that event obsolescence charges would be about the same.

From the data it is apparent that the last two items, "C" and "D," are considered to be the same for electric and fuel methods, leaving the real comparison between the totals of items "A" and "B." A fair figure for item "B" is $0.66 per metric ton in favor of the electric furnace, as has already been shown. This leaves the final comparison to item "A."

As the Westly electric-smelting method is practically a modification of the standard reverberatory-smelting method, the principal difference being the substitution of electric heating for extraneous firing, a comparison between the electric smelting and the standard reverberatory smelting is germane. For this purpose the following tabulation is given, showing what must be the cost of fuel delivered to reverberatory burners to be on a parity with electric energy delivered to the high-tension side of the furnace transformers:

COMPARATIVE COSTS OF ELECTRIC ENERGY AND FUEL FOR SMELTING

Cost of Electric Power in United States, Cents per Kw.-Hr.	Cost of Electric Power in United States, Dollars per Kw.-Yr.	Electric Power Cost per Metric Ton of Charge Smelted at 700 Kw.-Hr. per M. T.	Add $0.81 for Electrode Consumption Taken at 9 Lb. (4.1 Kg.) per M. T. and 9c. per lb.	Deduct $0.66 for Less Metallurgical Loss	Parity Cost in United States Dollars per M.T. of Pulverized Coal Delivered to Burners, Assuming 6.5 Tons Smelted per Ton Coal Burned	Corresponding Cost in United States Dollars per Barrel of Fuel Oil, Assuming 4.4 Bbl. Oil Will Do the Work of 1 M. T. of Coal
0.2	17.52	1.40	2.21	1.55	10.08	2.29
0.3	26.28	2.10	2.91	2.25	14.63	3.32
0.4	35.04	2.80	3.61	2.95	19.18	4.36
0.5	43.80	3.50	4.31	3.65	23.73	5.39
0.6	52.56	4.20	5.01	4.35	28.28	6.43
0.7	61.32	4.90	5.71	5.05	32.83	7.46

To determine whether or not the electric method is applicable to a given smelting problem it is evidently necessary first to ascertain if the cost of fuel is almost as great or greater than that given in columns "F" or "G" corresponding to the prevailing power cost (interpolate for intermediate amounts). If found so, then of course the figuring must be again done in detail, using exact costs and quantities and considering all pertinent features of situation and plant.

Electrode Costs Can Be Reduced

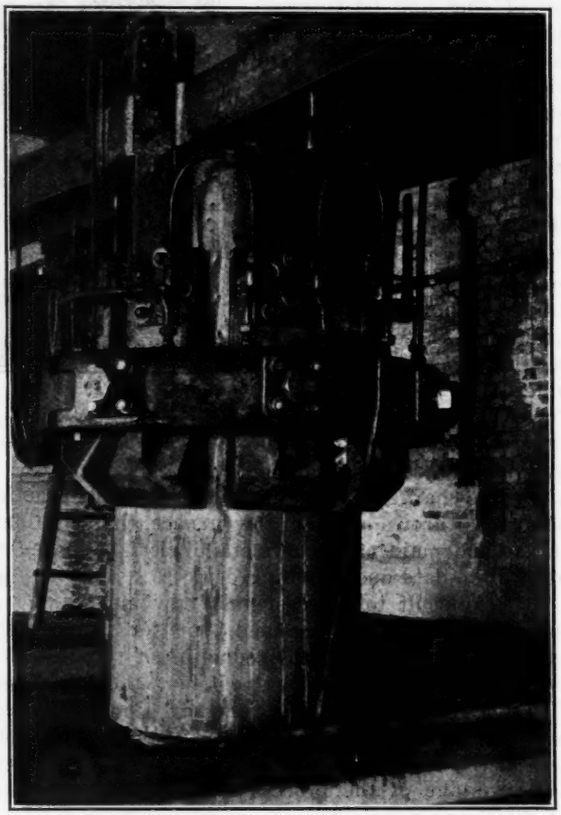
The Westly furnace is particularly adaptable for the use of the Söderberg continuous, make-in-place, self-baking electrode. Assuming that this electrode will save 4c. per lb. of electrode material and with no greater electrode consumption, there will be an additional gain of $0.36 per metric ton of charge on the basis of a consumption of 9 lb. per metric ton.

Even under conditions in which the electric method cannot be applied to the whole treatment, troublesome material, such as argillaceous concentrates (flotation or table), flue dust, or extremely fine matter, must be handled, the removal of which from the regular smelting operation will hasten that stage and save fuel. It is likely that the troublesome material can be treated in the electric furnace to advantage.

Another plausible use for the Westly furnace is for slag setting. Frequently a blast furnace or reverberatory delivers a highly viscous slag that gives poor settling results and it may be undesirable to run the furnace at a high heat. In such an operation it would only be necessary to boost the temperature of the slag to a certain degree to obtain the desired fluidity. This can be easily accomplished in a small container electrically heated.

Experiments were made in slag settling in the Westly furnace at Sulitjelma, and the results indicated that the power consumption was less than 233 kw.-hr. per metric ton. Taking cost of power at 0.5c. per kw.-hr. and the value of the copper in the slag at 10c. per lb., the amount of copper thus saved would have to be 12 lb. per metric ton to show a profit; or, if precious metals are present, a total metal value of $1.20 per metric ton of slag. As can be said of most of the recent advances in the art of metallurgy, there is no great novelty, either in the process or furnace, but practically all of the many "snags" have been overcome by the technical talent at Sulitjelma.

There is really no definite limit to the size of the furnace. The inside width would be 2 to 3 m., dependent upon the size of electrode selected. The spacing of electrodes would be 1 to 1½ m., depending on the size of electrode and bath resistance required. The number of electrodes would be selected to fit the phase number and power input. For example, a dozen 14-in. (35-cm.) electrodes placed in a straight line along the middle axis of the roof would not be abnormal. A furnace thus fitted would be about 15 m. long inside, would take 9,000 to 12,000 kw., and would easily smelt from 300 to 400 metric tons of charge per day. In a high-power furnace containing many electrodes the electrodes may be divided into, say, three groups, each group connected independently to its own transformer, thus permitting adjustment of the heat of either end or middle of the furnace independently.



AN 850-MM. (34-IN.) DIAMETER, CONTINUOUS (MADE AS USED IN PLACE), SELF-BAKING ELECTRODE
Used in a 1,400-kw. monophase carbide furnace of Gullspaangs Electrokemiska a/b, Gullspaang, Sweden. Equally applicable in the Westly furnace

Summary of Advantages

The advantages of the Westly electrical method therefore are:

1. Conservation of sulphur.
2. Low metal loss, both in slag and by dust.

3. No thermal fuel requirement has to be observed.

4. Great range of slag composition (SiO_2 up to 62 per cent).

5. The method is particularly applicable in localities where power is cheap and fuel expensive.

6. Consumption of power is less than 700 kw.-hr. per metric ton; therefore, the size of the furnace should be 3,000 kw. to smelt 100 metric tons per day.

7. The electrode consumption is less than 4 kg. per metric ton.

WESTLY ELECTRIC METHOD WITH ZINC ORE

Small-scale experiments of smelting zinc ore by the Westly method were conducted, with satisfactory results. The ore used for experiment analyzed in per cent: Cu, 1.35; Pb, 3.92; Zn, 25.52; Fe, 21.52; S, 19.15; Al_2O_3, 8.28; CaO, 5.32; SiO_2, 9.57. Total, 94.63.

The experiments were conducted for the purpose of first finding a charge capable of forming a fluid and an easily melted slag low in Cu, Pb, and Zn, and, second, to develop a method for carrying out the smelting in such a way that lead together with lead-copper matte would be separated out; and to prevent metallic iron from separating out.

A 3-PHASE, 1,800-KW. FURNACE OF THE SOUTHERN MANGANESE CORPORATION, ANNISTON, ALA., USING THE CONTINUOUS SELF-BAKING ELECTRODE

The zinc and lead fumes formed during the smelting were burned to zinc oxide and lead sulphate and were caught in flannel filters.

A charge consisting of 1,000 gm. of roasted ore (containing 2 per cent S), 200 gm. limestone, 150 gm. silica and 120 gm. pulverized coke (for reduction) gave satisfactory results. The smelting of this charge, which was carried out continuously, gave the following products:

1. Zinc oxide and lead sulphate, containing: 66.9 per cent Zn, equal to 83 per cent ZnO; and 10.6 per cent Pb, equal to 15 per cent $PbSO_4$.

2. Matte containing: 9.7 per cent Cu; and 3.2 per cent Pb. A small amount of metallic lead also separated out.

3. Slag containing: 0.08 per cent Cu; 0.03 per cent Pb; and 1 78 per cent Zn.

Testing Platinum-Palladium Separation

At the Reno, Nev., station of the U. S. Bureau of Mines a study is being made of the conditions affecting the separation of platinum and palladium by precipitation of the latter, using the dimethylglyoxime method. Samples from the Ordnance Department of the U. S. Army are being tested.

The Mica Industry of Argentina

Mica has been mined on a small scale in Argentina for many years, but it is only recently that the industry has received serious attention, according to *Commerce Reports*. In the five years preceding the war, 46 tons of mica was exported, of which the largest share went to Great Britain, the remainder being taken by Germany and Austria. In 1919 the exportation had increased to 145 tons, of which the United States took more than half.

The mica exported is muscovite, from the pegmatites of the sierras of Cordoba and San Luis, occurring throughout the extent of the Cordoba hills and northward through the provinces of Catamarca, La Rioja, Tucuman, and the territory of Los Andes. All of the mining is done on a small scale by individuals with little or no capital, and the mica is sold to factories or dealers in Buenos Aires. The chief local use is in the manufacture of electrical heaters, although one small factory in Buenos Aires selects and cuts mica for phonograph disks and other uses. There are, however, no figures available on the production of mica for domestic consumption. According to one mine owner, a metric ton (1 metric ton equals 2,204.6 lb.) of mica from the Cordoba mines will yield sizes as follows: Special, 15 kilos (1 kilo equals 2.2046 lb.); No. 1A, 35 kilos; No. 1, 50 kilos; and in increasing proportion through the following five grades to 300 kilos of No. 6.

According to the Argentine mining code, it is not necessary to own land to exploit the mica, mining rights being taken out by anyone locating the mineral, and therefore any American companies interested will not find it necessary to own mines. The numerous known deposits of the Cordoba hills, 200 miles west of the port of Rosario, are capable of being put on a producing basis if payment for the mineral can be made at the mine or railroad station. Lack of capital is holding back the workings. An American company well represented in the field could collect almost any desired quantity of Argentine mica for export.

Exports of Vanadium From Peru

During the calendar year 1920 a total of 198,760 sacks of vanadium ore, aggregating in weight 10,534 metric tons, was exported from Peru, and shipped to New York, according to *Commerce Reports*. The value in Peruvian money was fixed by the exporters at 12 sols per sack, with shipping expenses averaging 45 centavos per sack, giving a total valuation at the port of 2,474,562 sols. In American money the values fixed by the shippers amounted to $1,237,281, computed by giving an arbitrary value of 50c. United States currency to the Peruvian sol.

In the first six months of 1921 there have been only four shipments of vanadium ore, aggregating 44,562 sacks, with a total weight of 2,362 metric tons, valued by the shippers at 12.45 sols per sack at the port. In shipments covering the 1921 exports, the value has been reduced to American money at two for one as in 1920, giving a total of $277,400, despite the fact that Peruvian exchange has been more than 20 per cent below par during the year.

The local office of the corporation that has been the principal exporter of this ore advises that the maximum vanadio-acid content of the Peruvian product has during the last two years been 26 per cent, the average being 20 per cent.

The Tiu-Tiu-He Zinc-Lead-Silver Deposit, On the Siberian Coast

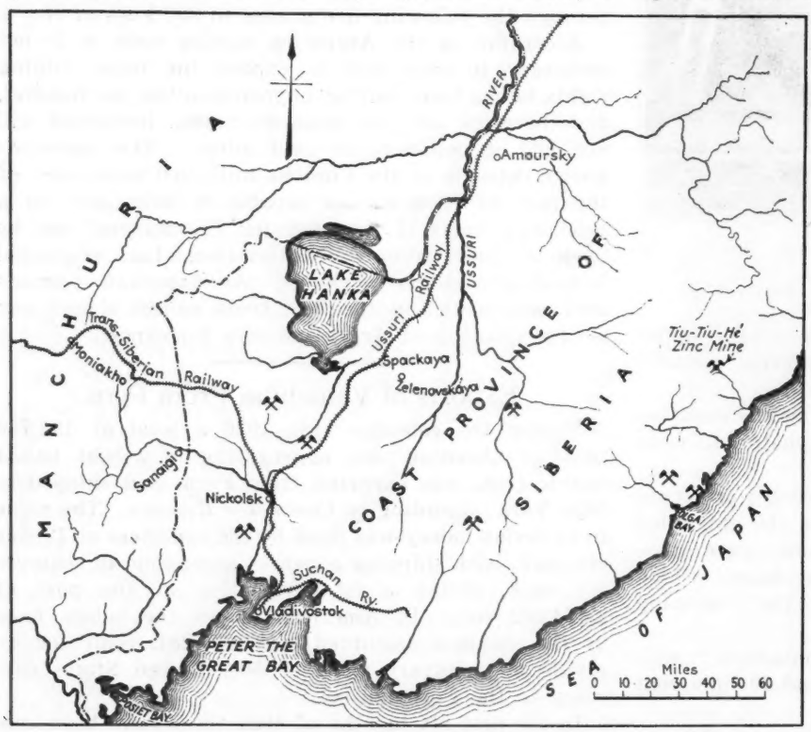
Calamine Ore Mined by Open-Cut Methods From Deposits in Southern Sikota-Aline — Hand Sorting Practiced and Aërial Tram Used To Convey Shipments From Mine to Tidewater — Coking Coal on Saghalin Island 400 Miles Distant

BY CHESTER WELLS PURINGTON

Written for *Engineering and Mining Journal*

MINING OPERATIONS on a considerable scale were carried on from 1909 to the outbreak of the Great War at a point twenty-four miles inland from the mouth of the Tiu-Tiu-He or Te-Tu-He Creek, in latitude 44 deg. 15 min. north on the east coast of Siberia, about 250 miles slightly north of west of the town of Otaru, Japan. The Tiu-Tiu-He mine is connected with the coast of the Sea of Japan, into which the creek empties, by a 2-ft. gage railway. The small harbor is indifferently protected. From this harbor to Vladivostok is about two hundred miles in a west-southwest direction.

About two thousand acres of mineral claims are held by the heirs of the late Jules Bryner, of Vladivostok, to whom the property originally belonged. About 1910, Messrs. Aaron Hirsch & Co., of Halberstadt, acquired a large interest, and a large deposit of calamine ore was developed by open-cut method. A Bleichert aërial tramway, one and one-half miles long, as well as the necessary surface buildings, and the light railway above noted, were installed. Although the claims were located in 1902, and patented in 1903, it does not appear that shipments were made on a commercial scale until 1907. Mr. Bryner informed me that about 140,000 tons of 50 per cent zinc ore (calamine), was shipped to Antwerp from Tiu-Tiu-He between 1907 and 1913.



SKETCH MAP SHOWING LOCATION OF TIU-TIU-HE MINE

Gluzdovaky ("Coastal-Amur Province"), Vladivostok, 1917, gives the detailed production for three years as follows:

	Calamine Ore (Tons of 2,000 Lb.)	Lead-silver Ore (Tons of 2,000 Lb.)
1912	31,600	5,700
1913	29,700	33,500
1914	22,600	15,300

Apparently the two estimates do not refer to precisely the same period, nor is it known what was the tenor of the lead-silver ore produced. As no considerable milling plant had been installed up to 1914, all the ore must have been of shipping value. It is reasonable to assume that the value of the ore produced in the period of operation has been between $5,000,000 and $6,000,000.

In superficial appearance the portion of the coastal Sikota-Aline mountain range resembles the Cœur d'Alênes of Idaho. It is heavily timbered with spruce, pine, and larch. The elevation of the range is from 2,000 to 3,000 ft., and in general the coast is bold and rocky. The region of the Sikota-Aline, lying between the 42d and 50th parallels, and between the Ussuri and Amur rivers and the coast of the Japan Sea, presents a striking similarity in size, form, and meridional extension to the area of the State of California. In the immediate vicinity of Tiu-Tiu-He, buttes or pinnacles of limestone are intersected with narrow canyons and jagged passes. The original calamine orebody, now worked out, was in the form of one or more stockworks occupying replacement cavities in limestone, in contact with quartz porphyry. The limestone lying on the west and the porphyry on the east, the general strike of the orebody is stated to be north-northeast in direction, with a dip of approximately 70 deg. to the east. The main orebody occupies the east side of a fairly sharp peak, near the summit, about 1,500 ft. above sea level. The mining and sorting were done by Chinese, and all ore above a certain grade was trammed to tidewater, as stated, loaded to steamers, and shipped.

The ore as taken out resembled chalcedony in appearance, was pearl-gray in color, translucent, botryoidal in structure, and with concentric laminations. It is stated that the sampling, after thorough development in 1907, resulted in the establishment of a calamine reserve of 200,000 tons of 48 per cent zinc tenor. As seen by the estimate of production given in the accompanying table, a large part of this ore has since been extracted.

The cost of mining, sorting, land and sea transport to Antwerp and marketing appears to have been about $15 per ton, before the Great War. Chinese labor then cost about 60c. per day gold, wages alone, and would probably be more than double today. Blasting dynamite cost in 1900 about 67c. per lb. at Vladivostok. All mining was done by hand, no air drills being used so far as I have been able to ascertain. The technical staff in charge of operations was composed of Germans and Russians.

Since 1914 a considerable number of foreign engineers have visited this property, and numerous metallurgical tests have been made on the concentrating zinc-lead-silver ore which has been found underlying the calamine orebody, and in adjacent veins. Between the top of the mountain and the creek, a vertical distance of about 800 ft., a tunnel for development purposes has been driven about one-third the distance from the summit to develop low-grade ore lying beneath the stockwork. This and other development work are said to have established the possibility of about a half million tons of ore carrying 18 per cent zinc, 12 per cent lead, and 8 oz. of silver per ton. What the recovery will be and what process is most suitable appear to be points on which opinions vary. Below the level of the tunnel, to that of Tiu-Tiu-He Creek, and even lower, there are stated to be further possibilities for the development of low-grade sulphide ores.

Region Possesses Attractive Prospects—Coal at Saghalin

The region has so far developed about twenty mines and prospects of base-metal ores, including some copper showings. Tiu-Tiu-He is the only mine on which any commercial work has been done, and as the region is little equipped with trails, and covered with dense vegetation, prospecting is difficult. Lines of structure are strong, and the known ore deposits follow the north-northeast strike before noted. The limestone cliffs and mountains in the vicinity are characterized by caves of great size due to solutional action. The largest of these, the "Mokrushinski," lying about twenty miles west of Olga Bay, slightly to the south of Tiu-Tiu-He, has been only partially explored. It has been penetrated for 500 ft., and contains one chamber over 200 ft. long and 60 ft. in height.

Large deposits of coking coal at seaboard on Saghalin Island, about 400 miles northeast from Tiu-Tiu-He harbor by sea, would provide necessary fuel if the lead and zinc deposits of the southern Sikota-Aline should prove of sufficient importance to establish a smelting industry.

Improving Treatment of Silver Precipitates

At the Intermountain Station of the U. S. Bureau of Mines, in a study of the treatment of silver precipitate from acidified brine leaches, a detailed examination showed that the difficulties being experienced in the precipitation of silver, because the precipation was of too low-grade, and therefore hard to refine, were due primarily to arsenic which was collected in the solution on acidifying the same with the acid roaster gas. Schemes were worked out to treat the impure product thus formed, and the necessity in future design of elimination of dust and arsenic from roaster gas before using this latter to acidify solutions under treatment was emphasized.

An Improvement in the Manufacture of Vessels Used in Retorting Zinc Ores

By J. P. Varian
Written for *Engineering and Mining Journal*

Present practice in the manufacture of the clay retorts and muffles used in zinc distillation furnaces is generally as follows:

The crushed clay and grog, mixed in definite proportions with enough water to obtain the desired consistency, are put through a pug mill and then compressed into balls. These balls are piled in air-tight pits and allowed to remain intact for a certain period, after which they are repugged and made into retorts and muffles. These are thoroughly dried and are then put into preheating kilns, daily, where they are brought up to the temperature of the furnaces. Little improvement has been made in recent years in the preparation of the clay and grog for the first pugging.

It is good practice, but is seldom carried out, to have the grog sized so as to secure a minimum of voids. It is of still more vital importance to coat each individual grain, no matter how small it may be, with a thin film of clay. This seals up the pores and permits a stronger bond between the grains of grog and the clay. It would be ideal if this film was all that was necessary to bind the grains together. Unfortunately, sufficient plasticity would not be obtained to work the clay.

To obtain a film of this nature in any pug mill is difficult, if not impossible, because the clay cannot be thinned to a sufficient degree. To accomplish it and at the same time improve the process, if possible, the modifications as here set down are proposed:

The clay is received from the freight car into a large tank, which is at least 10 ft. high and 20 ft. in diameter. At the same time that the tank is being filled, enough water is added so that when the tank is full the mixture will be of the consistency of a thin mud. Some means of mixing should be provided, and it must be in operation from the addition of the first lot of clay. A sump should be provided at the bottom to receive the sand, pyrite nodules and other matter which may separate during the mixing. There should be a number of these tanks to provide sufficient storage.

As the tank is filled the grog should be added, in the proper ratio to the amount of clay present. This can be continued until the tank is full of clay, water, and grog in definite amounts. Agitation should continue until a uniform mixture results. The tank may now be allowed to stand; its contents should be of the consistency of a cement slurry, and the pulp should be of such a density that the grog will remain in suspension. The tanks are left in this condition until the desired "rotting" is accomplished. Some clear water may form a layer at the top and may be removed. If the clay-grog mixture cannot be dried enough in the tank, it may be removed, stored, and allowed to dry until it is hard enough to be pugged and made into vessels.

Crushing of the clay and one pugging is eliminated by this process. Drying and weathering of clay before crushing will be unnecessary. A washed and refined clay is obtained, freer from sand and other impurities. The clay mixture is constant and uniform. The individual grains are coated with a thin film of clay and porosity is thus reduced. Crushing, mixing, and "rotting" are accomplished in one operation, and all handling may readily be done mechanically. The mixing tanks permit of a minimum amount of storage space.

Mining at Stanford University

A Six-Year-Curriculum Arranged to Afford a Broad Foundation In Science, Language, English, Economics, and History—Intensive Work in Mining and Metallurgy a Feature of the Graduate Course

BY GEORGE J. YOUNG
Western Editor, *Engineering and Mining Journal*

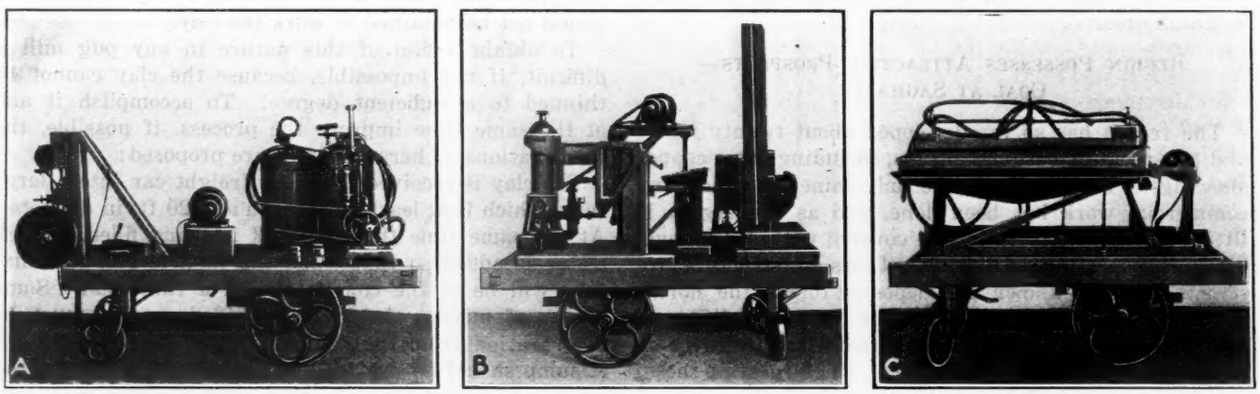
FOR A NUMBER OF YEARS Stanford University has had a course in mining and geology in which the geological element was perhaps strongest. Nevertheless, many able men were graduated who distinguished themselves in mining, metallurgy, and geology. Although the number is small, the quality is high.

After some discussion in 1915-16-17, participated in by mining alumni, the president and T. J. Hoover, the new head of the mining division, as to the best course in mining engineering and related subjects, a definite policy was agreed upon and put in operation.

As this policy resulted from the discussion of mature men, experienced in the mining industry, a statement of its important features should be of considerable interest. Four years, owing to the number and complexity of the vital subjects, was considered insufficient for a satisfactory education. The outcome of the discussion was to establish a two-year graduate course in which the mining, metallurgical, and petroleum specialties would be intensively given, the student having the option of any one of these specialties. Entrance to the graduate course would obtain from a four-year undergraduate course especially planned to lead up to the work of the graduate course.

The course as planned differs, according to T. J. Hoover, from the Columbia University six-year course. Mr. Hoover analyzed fifty mining courses and tried to discover the law underlying them. His conclusion was that mining courses have been built around men, each representing the work of some expert or leader. Starting out to plan his course, Mr. Hoover first decided upon two main subdivisions, mining and metallurgy. The subject headings used by Le Neve Foster suggested the naming of each principal subdivision.

Four distinct sections were decided upon—economics of mining, mining proper, metallurgy, and petroleum. In each of these sections one course is planned which covers the entire subject in a general way. The course is given to undergraduates, allowing an option between the study of mining and metallurgy and the course in petroleum. The object of these general undergraduate courses is to enable the student to visualize the subject before he has definitely selected his graduate specialty. The detailed courses in mining and metallurgy and in petroleum are extensions of the general courses. Thus, if the undergraduate takes all of the general courses and digests them, he will have an authoritative review of the field and can select his objective in the graduate college with greater assurance than is possible with most mining courses.



PORTABLE LABORATORY APPLIANCES

A—Power unit, with speed reduction, compressed air and vacuum to be attached to other units as needed.

B—Flotation machine unit, which was designed to be attached to a power unit as needed.

C—Concentrating table (gravity) unit; the device to be attached to power as needed.

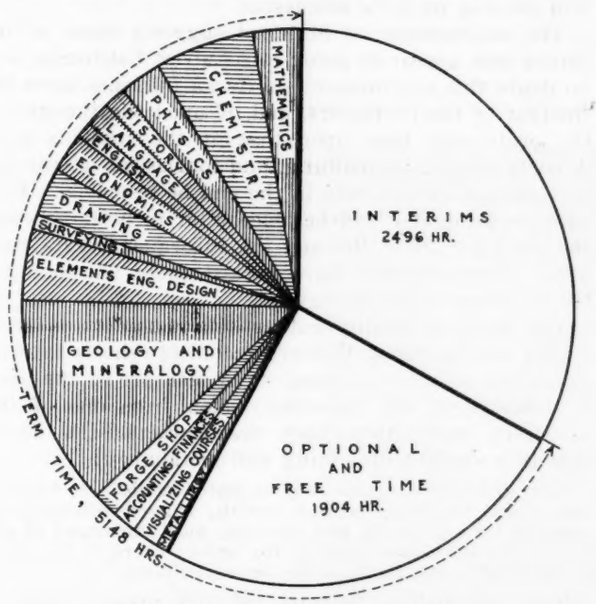
MONEY GOES PRINCIPALLY INTO TEACHING STAFF

It was also decided to put the available money into the teaching staff, books, and small-scale laboratory equipment, with the objective of developing determinative work as related to the industry rather than facility in the operation of various commercial machines. Thus, the training was to be mental rather than objective. Emphasis was to be placed on a broad, sound, technical education. As T. J. Hoover put it, the objective was not a "glorified mechanic" but a well-trained technical man.

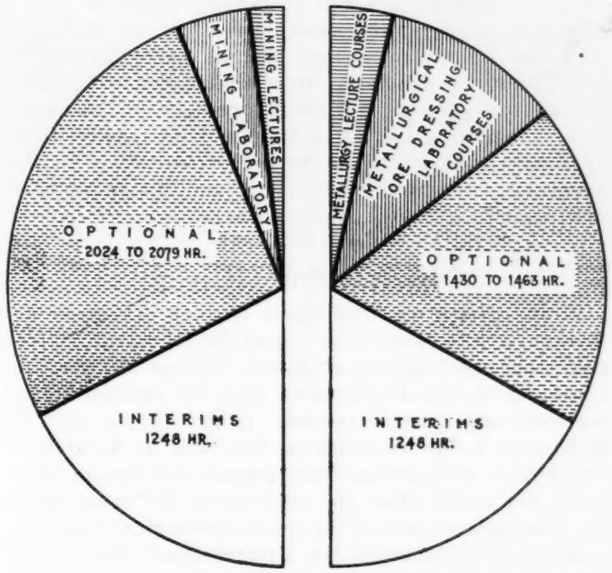
Mr. Hoover, an engineer of mature experience in many capacities, has made a name for himself in the mining industry. So far as I am aware, this is his first experience in educational work. As his chief assistant in metallurgy, James M. Hyde has been selected. Mr. Hyde has also considerable experience in the industry and has had some educational experience. As associate professors, three young men of more or less experience, W. J. Crook, W. F. Dietrich, and F. G. Tickell, have been selected. W. D. Mills and W. H. Shockley, both well known in the industry, have been appointed

as part-time lecturers. The component parts of the personnel represent maturity, experience, and youth. The dominating part of the personnel, it must not be overlooked, is representative of mining and not of the educational element.

A mining course evolved as this one was, and planned by men of considerable experience in mining, is of great interest and worth analysis. The pre-mining course of four years is arranged "to give prospective engineers a broad foundation of science, language, English, economics, and history." This course on an estimated time basis is given in the tabular summary and graphically depicted in the above illustration.



196 Weeks at 39 Hr. per Week, 7644 Hr.
Pre-Mining Course, 4 Years



Graduate Mining Course
2 Years (3822 Hr.)

Graduate Metallurgical Course
2 Years (3822 Hr.)

Total Time Based on 39-Hr. Week

PRE-MINING COURSE AND GRADUATE COURSES

In the two graduate years, it is not possible to lay out a precise course, as the minimum requirement is 90 units, or an average of 15 units for each of the six quarters. The maximum is approximately 120, of which 60 units are for mining and metallurgy courses and 60 units for cultural and other courses. The graduate student is allowed a liberal option, amounting to more than one-half of the total units. The optional courses are decided upon by consultation with the instructors, so that it can be said that the student is the arbiter of his own course. Thus individual talent can satisfy itself, limited only by the resources of the university in teaching staff and facilities. In economics of mining and the study of mining the following courses are offered:

PRE-MINING COURSES

	Hours	
Mathematics (through calculus)	220	
Chemistry—		
General	99	451
Determinative	352	
Physics—		
Lectures and laboratory	198	
History	99	
Language	99	
English	66	440
Economics (social, economic, political)	176	
Drawing (instrumental, lettering, descriptive geometry, machine drawing)	220	
Surveying (elementary)	55	
Theoretical mechanics	110	
Strength of materials	99	308
Hydraulics (*a*)	99	
Geology—		
Mineralogy—		
Paleontology	132	
Dynamic geology	55	
Mineralogy	88	
Crystallography	88	
Economic (non-metals)	44	946
Economic (ores)	44	
Field geology	(*b*) 264	
Topographic geology	(*b*) 231	
Systematic mineralogy (*a*)	88	
Mechanical—forge shop	110	
Accounting	33	
Corporation and trust finance	44	
Accounting of investments (*a*)	44	
Principles of mining	55	
History of mining	11	
Principles of metallurgy	55	
Principles of petroleum mining (*a*)	55	
Pyrometry, assaying, metallurgical calculation	22	
Pyrometallurgy—Iron and steel (*d*)	33	
Valuation fuels and oils (*d*)	44	
	3,482(*c*)	

(*a*) Optional; principles of petrolum mining taken by petroleum students only. (*b*) Estimated. (*c*) Total, less hydraulics, pyrometallurgy iron and steel and systematic mineralogy which are optional with accounting of investments, is 3,262 hours. Laboratory and field hours total 1,662. (*d*) Choice of either one.

	Hours	
Mine valuation	11	
Mine organization	11	
Mine management	11	
Mine rescue and first aid	11	
Prospecting and development	33 to 55	154 to 176
Surface equipment	22	
Surface operations	22	
Underground operations	33	
Laboratory courses		
Valuation, organization, management	99	
Equipment plans	22 to 33	341 to 374
Mining machinery	44	
Mine operations	44 to 66	
Mining research and thesis	132	
Total	495 to 550	

Total time in 66 weeks, 39 hours per week, 2,574 hours.

The graduate courses offered in metallurgy are as follows:

	Hours	
Crushing, sizing and classification of ores	22	
Concentration processes	22	
Hydrometallurgy—gold and silver	33	
Hydrometallurgy—copper, lead, zinc	33	
Pyrometallurgy—iron and steel	33	
Pyrometallurgy—copper, lead, zinc	33	286
Pyrometallurgy—nickel, aluminum and minor metals	33	
Electrometallurgy	22	
Metallography	11	
Pyrometry	11	
Metallurgical calculations	22	
Assaying	11	
Laboratory		
Ore dressing	66	
Hydrometallurgy	66	
Metallurgical machinery—design	66	
Pyrometallurgy	66	
Electrometallurgy	66	825 to 858
Metallography	66	
Pyrometry	66	
Metallurgical analysis	99 to 132	
Metallurgical research and thesis	132	
Assaying	132	
Total	1,111 to 1,144	

In addition, the department of economic geology offers a seminar on ore deposits and special courses, and in the civil engineering department, a course in

engineering estimates and reports is open to the mining students. All other departments in the sciences and arts are open to the graduates within reasonable limitations.

The pre-mining course gives a modest preparation in mathematics, chemistry and physics, in all 869 hours. In history, language, and economics there is an approximate total of 517 hours. In engineering subjects representing the foundation work in design there are 308 hours. Graphostatics is omitted and is probably optional. Drawing is apparently covered, but the time devoted to surveying is scant. Surveying is often designated a "bread-and-butter" subject for mining students, and it is interesting to note that this phase is not considered of the same importance as in other schools. Most of the geology is thrown into this pre-mining course, and herein is an apparent inconsistency. Shop work is included, as are the visualizing courses in mining and metallurgy. Apart from the generous proportion of time given to economics, the course is not especially novel, nor will other schools be greatly influenced by it.

In the graduate courses there is a considerable dissection of the general subjects, and the time devoted to some subjects, particularly the mining subjects, is limited. One hour per week lecture courses are considered by many instructors to be objectionable. Exceptionable efficiency would be required in imparting mine valuation in eleven hours. It is true that this course is extended into the laboratory, but even then the student must put much extra time upon it to cover it satisfactorily.

Large Graduate Enrollment Not Expected

The dissection into many subjects is further aggravated by the Stanford system of dividing the year into three eleven-week quarters with an interim of a fourth quarter. The net result is that the beginning and ending time of a class unit in the aggregate represents a large waste of effort. There is the further waste of getting started and ending up a quarter, which is done three times in each year. Thus the work is carried out in small increments interspersed with larger increments, all interruptions to continuous effort. However, this is the obvious criticism. As the course is in process of experimentation, changes will undoubtedly be made both in the allotted time and in the number of separate courses.

Mr. Hoover informed me that a large graduate enrollment was not expected; in fact, thirty students is about all that preparations are being made for. With five faculty members and two lecturers in mining and metallurgy, there is abundant time for personal contact with faculty and graduate students. Broken up into three groups, mining, metallurgy, and petroleum engineering, this would give an average of five to each course in each year. Under such circumstances it is probable that the talents, aspirations, and even the family history of the students will be every-day knowledge to the instructors. Under such circumstances, also, segregation of courses and definite time allowances become unimportant.

Another interesting feature is the junking of large-scale equipment. No attempt is to be made with the milling of large lots of ore, nor with the conduct of mining operations. Instruments for quantitative laboratory measurements are to be liberally supplied and experiments will be on a small scale. In the ore-dressing laboratory small concentrating tables, flotation machines, and other units are mounted on wheeled stands, and can be moved wherever wanted. This will be looked upon as a "sacrilege" by some mining schools that have spent much money to avoid the stigmatization of "test-tube schools" and are proud of the "near-mills" and "smallest commercial unit" apparatus. In the race to be considered "practical," this recession at Stanford will provoke no little discussion.

The environment of Stanford suggests many of the things that appear in guide books about California, and no doubt this environment exerts an influence upon the thought of the professors, and, if upon the thought of the professors, then upon that of the students also. A horticultural, agricultural, and touristical setting for a "technical" school may in the end be beneficial. Perhaps its graduates will be able better to wear through the staid forties of life and the subsequent years than other graduates who have hocked their all upon intensive study of technology.

The ideal of quality rather than quantity is sufficiently scarce among Western technical schools to warrant applause when it appears. A measure of the ideal is indicated in the following, taken from one of the university publications upon the characteristics desirable in a student of mining and metallurgy:

> "The absolute essentials may be stated as absolute honesty and moral courage, perfect health, rugged constitution, capacity for hard work, and, probably most important of all, a strongly developed instinct for order; there is no place in this profession for disorder or slovenliness."

The outstanding features of the present mining course of Stanford University are the six-year course, with its manifest attempt to develop other as well as technical subjects, its loose curriculum as contrasted with the strictly prescribed one, its generous optional provisions, its insistence upon the student's initiative in selecting courses, its faculty contact, its avoidance of extreme objective instruction, and its faculty drawn from men experienced in the industries. It is another experiment in mining education, and its development and outcome will be viewed with interest.

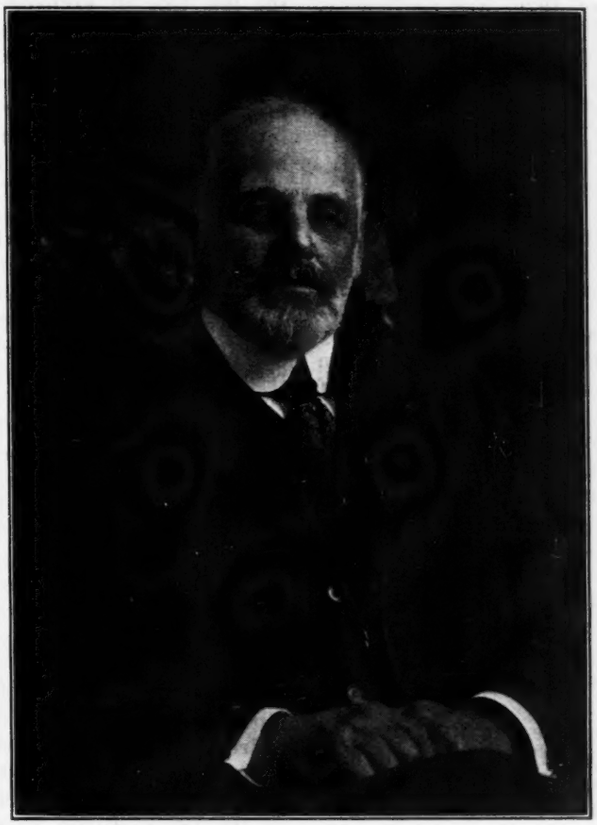
Metals in Early History

In an address on "The Early History of Copper and Bronze," at the recent meeting of the Birmingham local section of the Institute of Metals, George Mullins said, according to *The Ironmonger*, that the earliest known use of copper was reported from Egypt and the Euphrates Valley probably as far back as 5,000 B. C. The Cretan civilization knew copper and bronze about 4,000 B. C., and after the subsidence of Cretan power the Phœnicians carried on the metallurgical tradition.

Metal work began in the British Isles with the use of Irish copper tools about 2,500 B. C., originating apparently under influences from the Mediterranean, probably through Spain. The first metal used in England was bronze, introduced about 1,800 B. C., and was imported from the Continent, the constitution of the remains found showing that the bronze must have been made by people who had been accustomed to its use. With regard to the use of iron by prehistoric man and in the earlier historic ages, the speaker remarked that it should be remembered that the word "iron," as well as the word "ore," was derived from *aes*, which was usually translated "brass," but often, as, for instance, in the Bible, meant "bronze." The word *aes*, in fact, was the name given to any metal that was worked.

Geologists of Note
James Furman Kemp

WHEN THE TITLE "Daddy" or "Uncle" is applied to a professor by his students, it is a dead sure sign that he has won a warm spot in their hearts. This note of university life finds expression in the great esteem in which James Furman Kemp is held by his students, old and new. Kindly, sympathetic, modest, an inspiring figure in his profession, he possesses qualities that have naturally endeared him to those who have been fortunate enough to come in contact with him in classroom and field. His career has been that of a scholar. Born in New York in 1859, he was one of the first students in Adelphi Academy, and, graduating in 1876, he entered Amherst. Being always fond of outdoor life, hunting, fishing, and the like, he was early attracted to geology. While at Amherst a mining excitement was engineered in the town, and many townspeople — the faculty was also not immune — suffered the usual severe losses. The little experience was a moving influence in his decision to prepare to teach geology from a mining standpoint and to do what he could to spread sound education on ores and minerals. Years afterward in reading J. D. Whitney's "Life and Letters" he was interested to observe that the same motive had actuated Whitney to prepare his "Metallic Wealth of the United States," an extremely influential work. On graduating in 1881 from a fairly severe classical and scientific course, Professor Kemp entered the School of Mines of Columbia College, as it was then called, and received an E. M. degree in 1884. He did all the work he could with Prof. J. S. Newberry, then one of the veterans of American geology and especially experienced in the West. He was his private assistant later, and in 1885 accompanied him to the International Geological Congress at Berlin, remaining in Germany after the sessions to study petrography and mineralogy at Leipsic and Munich. Returning to the United States, Professor Kemp taught at Cornell for five years and was called to Columbia in 1891 to succeed his old teacher, Professor Newberry, who had become incapacitated. Columbia has been his home ever since except for a short absence from his professional duties there on account of illness.



JAMES FURMAN KEMP

It has been Professor Kemp's aim to see all that he consistently could of the mining districts of America and Europe. His book, "Geology and Ore Deposits of the United States and Canada," was the first thorough work of its kind in the country. Practically all mining engineers are familiar with it. Adirondack geology, particularly its Pre-Cambrian problems, have greatly interested him, and he has written constructively upon the subject. The most active problem in his mind has been that of ore formation. Of the influence and importance of igneous agents in the cooling stages of intrusive rocks he early became convinced, and has written much to show not only that these agents *might* produce the effects but that there was no other reasonable cause which would. The comparatively shallow depths to which the evidence shows the ordinary ground water to extend was one important conclusion; and the necessity of contributions from the igneous mass to the contact zones was another, the last coincidentally advanced with Professor Lindgren. A list of the literature which Professor Kemp has contributed to better understanding of mineral deposits and geology would be far too long to include here. Occasionally he has appeared as an expert geological witness in mineral litigation, and has been engaged in a consulting capacity on both mineral and other projects. He has been very active in the affairs of the American Institute of Mechanical Engineering, was its president in 1912 and is now an honorary member. He is a familiar figure at practically all the meetings of the Institute, not to forget Mrs. Kemp, who has been his constant companion in all his trips. His interest has also extended to the Mining and Metallurgical Society, the Geological Society of America, and other scientific organizations.

The affection of his students for Professor Kemp is reciprocal. "I never would have been happy if I could not have taught and have had students around me who have been a hundred times more to me than I could tell them in words," is how he modestly expresses it.

THE PETROLEUM INDUSTRY

Rumania's Petroleum Industry During 1921

SPECIAL COMMUNICATION

According to returns so far available, the production of crude oil in Rumania for each month of 1921, compared with the same period of 1920, was as follows:

	1921 Metric Tons	1920 Metric Tons
January	97,825	70,028
February	82,724	66,354
March	93,165	79,149
April	97,601	90,735
May	99,368	78,436
June	79,722	79,757
July	83,694	83,313
August	106,217	99,005
September	102,338	99,960
October	112,311	91,098
November	105,920	101,248
December	100,000	94,934
Total for the year	1,160,885	1,034,017

The increase in production over the preceding year was about 125,000 tons, or 12 per cent. It is equal today to about 60 per cent of the pre-war production, when during 1913, the record year, 1,885,617 metric tons of petroleum was produced.

The industry is slowly recovering from the destruction brought about by the war. Indeed, it is a matter of record that during the winter of 1916 the oil wells were completely destroyed by the Allies, to avoid that large quantity of oil, badly needed by the Germans, falling into their hands. Notwithstanding the strenuous efforts which the invaders made to repair the wells, they were unable to produce more than 527,491 tons in 1917. Nevertheless, in 1918 the output was 1,214,219 tons, and the Rumanians have not been able, up to date, to equal this total.

The principal causes responsible for this situation were of three different orders: First, materials difficulties, due to lack of proper and regular means of transportation. Materials can be only slowly, at enormous cost, and with great pains sent by rail to Rumania, on account of the chaotic situation of the railroads in the neighboring countries—Hungary, Czecho-Slovakia, and Poland. On the other hand, for the maritime transports, only two ports, Braila and Galatz, can be used, and conditions are unfavorable, because these harbors are usually blocked by ice during several months in winter, and are lacking in modern and powerful equipment to handle the merchandise after its arrival.

Worst of all, in Rumania itself, the traffic facilities of the national railroads are utterly insufficient. The country has not at its disposal the cars nor the engines which it needs to carry from the harbor to the oil fields the general supplies which must come from industrial countries, like the United States, England, France, Belgium, and Germany. Production on the fields often has had to be limited because all available tanks were entirely filled. Producers could not ship the oils to the refineries or consumers, because they had no tank cars, and the pipe lines were not operating, or, if so, only at a reduced capacity.

In the fields where power is dependent on electricity operations have been greatly handicapped, and even suspended for weeks, by the frequent failure of the power-house of the electrical company of Campina, which supplies the greater part of the current used.

The sinking of new wells is entirely dependent on the material which operators can buy abroad, and purchases and replacements are rendered exceedingly difficult by the low rate of exchange on Rumania money. This financial difficulty is greater today than ever before.

The last, but not the least, cause of reduced output and difficulty in production which has handicapped the progress of the oil industry in Rumania is the continual interference of governmental regulation in the oil business. This has operated along three lines: fixation of maximum prices—but not in accordance with the producing cost—for the oil sold inside the borders of the country; limitation of the quantity which could be exported, and heavy taxation on the product sold on the foreign markets. Against all these difficulties the oil producers of Rumania have done their utmost, and they have not succeeded so badly, if one considers that the results obtained surpass by far those that have been possible in all other kinds of Rumanian industries.

The country as a whole is taking great interest in the oil business. National capital investment is much more largely represented in this branch of activity than it was before the war. The total nominal capital of all the companies is 2,650,000,000 lei[1], on which 2,273,000,000 have been paid. The increase during the last year alone has not been less than 950,000,000 lei, and it will not be surprising to learn that this increase has been the largest ever recorded in the Rumanian petroleum industry.

The prospects for the future are encouraging. The pipe lines are operating daily more satisfactorily; the railroads have bought some equipment, and the great harbor of Constanta, which is open all the year round, can be used regularly. Indeed, the large Carol bridge, on the Donau River, which was destroyed during the war, has been repaired, and it was reopened for traffic on Dec. 15, 1921.

In an effort to improve existing power conditions, the Steaua Rumania, one of the largest operating companies, is building a power house in Floreshti, which will furnish electrical current, conjointly with the centrals of Sinaia and Campina, to the oil fields of the Prahova district. It is expected that the new electrical plant will be in operation next summer. It cost 50,000,000 lei, and will be able to produce 6,300 kilowatts. Arrangements are provided to carry its capacity to 24,000 kva.

The number of wells which are now being drilled is 264, of which 30 are using rotary apparatus; 20 are being water-flushed, 14 are using cable tools, and 200 possess Canadian-Galician outfits. Compared with the production of the United States during 1920, 443,402,000 bbl., or 58,972,466 metric tons, the production of Rumania seems small. Other differences are interesting:

[1]The lei was before the war rated as equivalent to 19.3c. United States currency.

The number of producing wells in the United States on Oct. 31, 1920, was 258,600, which gave a daily average output of 3.9 bbl., or about 650 kg. each. The 700 wells of Rumania are producing daily 3,250 tons, or an average of 4,600 kg. per well in twenty-four hours. The American production in some fields like that of Pennsylvania (where 67,700 wells are operated) is less than 0.3 bbl. per well, and in the old region of that state, which has been worked for fifty-five or sixty years, the output varies from 0.2 to 1.1 bbl. per day.

In Bushtenari, the oldest field of Rumania, operated for twenty-five years, the production for the 225 wells is again 210 tons, or 900 kg. per well. These facts show the relative wealth of the Rumanian oil fields and the skill of the American oilmen, who are able to operate with a profit exceedingly poor wells.

Solubility of Oil Shales

In the course of certain experiments designed to determine the solubilities of different shales after they had begun to yield oil by distillation, it was found desirable to determine the quantity dissolved from certain unheated shales by various solvents, at or near the boiling points of these solvents. These experiments were made in connection with the oil-shale investigations being conducted by the U. S. Bureau of Mines, in co-operation with the states of Colorado and Utah, and are outlined in a paper by Martin J. Gavin and John T. Aydelotte which is included in *Reports of Investigations*, U. S. Bureau of Mines.

Five oil shales were used that are representative types from the districts in which they were collected, although not necessarily representative as regards richness. They may or may not be of greater richness than the average for the districts.

Each sample was ground to pass a 20-mesh screen, and all material that would pass a 60-mesh screen was rejected, as such fine material clogged the filter and made extraction slow. Twenty grams of the ground sample were placed in a filter paper capsule in an apparatus of the Soxhlet type and extracted with the solvent in the usual manner with this type of apparatus. Extraction takes place at a temperature somewhat below the boiling point of the solvent. Extractions were continued for two hours after the refluxing solvent became clear. Then the solvent containing the extract was removed from the apparatus, and the solvent distilled off at as low a temperature as possible. The dish containing the extract was carefully heated to remove last traces of the solvent, dried in a dessicator, and weighed. In each case, results reported are based on two or more closely agreeing tests. In should be noted that the percentage extracted is based on the weight extracted and not on the loss in weight of the shale.

In physical appearance, the extracts from all the shales were similar. They were dark brown or black in color, and with the exception of that from the Ione, Cal., material, were of the nature of a heavy asphalt, somewhat resembling some of the natural hydrocarbons. The extract from the Ione material was waxy and practically fluid at room temperature (72 deg. F.). Their volatilities were low. They were not appreciably affected by cold concentrated sulphuric acid, were insoluble in cold alcohol and slightly soluble in hot alcohol. They were not attacked by cold nitric acid. Each had a faint odor much like that of the freshly broken shale from which the extract was made.

The results of the experiments, tabulated, show the source of the shale; the amount of oil produced from the shale by distillation in the Bureau of Mines type of assay retort, expressed in gallons per ton; the amount of oil recovered by such distillation, expressed as a percentage by weight of the raw shale; the percentage (by weight) of the shale extracted by the particular solvent, and the relative amount of extract produced, expressed as a percentage of the oil yield by destructive distillation.

Disregarding the Ione, Cal., material, which is evidently a lignite, it is noted that an appreciable amount of the organic constituents of the Utah, Colorado, and Wyoming shales tested may be removed by certain of the more commonly used solvents of petroleum. In the case of De Beque, Col., shale the extract with chloroform amounts to 18.22 per cent of the weight of oil produced by destructive distillation. This shale appears to be more soluble in each of the solvents used than the other shales examined.

It is evident, therefore, that such solvents as were used in these experiments do have an appreciable action on the organic oil-yielding matter of oil shales. The Kentucky shale is by far the most resistant to the solvents used. The extract in all cases, however, is not what would ordinarily be termed oil, and certainly, as is to be expected, it is not at all like the oil produced by distillation of the shale. Nevertheless, until the nature of these extracts has been determined, it would be well to accept with reservation the belief that oil shales contain no oil as such. The writers do not believe that the extracted materials are oils, in the common meaning of the word, but certainly the extracted material is much like certain of the natural hydrocarbons, supposed by many to have been formed from petroleum by oxidation. A careful study of such extracts might be of considerable value in determining the origin of oil shales. It is to be noted that the solubility of a shale is not an index of its relative oil yield. The shale that was most soluble in all the solvents was the Colorado shale, yet both the Utah and Wyoming shales yielded oil on distillation at a higher rate.

Wyoming Oil Sands

SPECIAL CORRESPONDENCE

Two thousand acres of oil sands, sixteen miles from Wamsutter, Wyo., have recently been sold. This is the first lease permit issued upon oil sands. It requires that a minimum of $20,000 be expended upon the lease each year for the next five years. The oil sands outcrop along an escarpment for three miles, an average of 50 ft. thick. They have been sampled by Government engineers, in 1,000-lb. lots, and contain 11 per cent petroleum, or 30 gal. per ton, of which 12 per cent is gasoline, 12 per cent kerosene, and 14 per cent gas oil, and the remainder lubricating oils.

A recent patent for the treatment of oil sands has been demonstrated in a small way, and a larger plant will soon be in operation. This will extract the oil in a short time with steam and hot water—a continuous operation. The sands are clean and white as they leave the plant. The residue contains enough carbon to supply all the heat necessary for the operation of the plant.

It is estimated upon a large body of sands similar to those in Wyoming, where the material can be handled by steam shovels, that the oil can be extracted for 27c. per bbl.

Technical Papers

Mining in California—A monthly publication entitled "Mining in California" will be issued by the California State Mining Bureau, beginning with the January, 1922, number. The new publication will be a monthly chapter of the state mineralogist's annual report and will disseminate information relative to all phases of the state's mineral industry and the various activities of the State Mining Bureau. Several features not customarily found in official reports, such as lists of buyers looking for particular minerals, lists of producers who are seeking a market, and a technical employment service, will be included. Those who wish to have their names on the mailing list should make request to the State Mining Bureau, Ferry Building, San Francisco, Cal.

Haynesville Oil Field—A report on the Haynesville oil field, in Claiborne Parish, La., by W. W. Scott, petroleum engineer, U. S. Bureau of Mines, and Ben K. Stroud, Supervisor of Minerals of the State of Louisiana, has been published by the Department of Conservation of the State of Louisiana. The report considers drilling methods, water conditions, production, and recommendations for further development. A map of the field which accompanies the report shows the location and status of the wells as of Dec. 31, 1921, the known limits of the field as of that date, the location of edge water with respect to structure, the encroachment of edge water during December, 1921, the status of the individual wells with regard to the production of oil and water, and the source of water. Copies of Bulletin No. 11, "The Haynesville Oil Field," may be obtained without cost by applying to the Department of Conservation, Ward Building, Shreveport, La.

Peruvian Petroleum—"Outline of the Geology and Development of the Petroleum Fields of Peru, S. A. With notes on Other Occurrences in the Peruvian Republic," by V. F. Marsters, has been published as a bulletin of the American Association of Petroleum Geologists. A short article on the same general subject by Mr. Marsters appeared in *Engineering and Mining Journal* of June 25. The bulletins may be secured from Mr. Marsters, 400 Reliance Building, Kansas City, Mo.

Petroleum Utilization—The *Journal* of the South African Institution of Engineers for December, 1921 (Johannesburg; price, 3s.), contains an eighteen-page illustrated paper entitled "Oil for Power Production: Some Notes on Recent Developments of Diesel and Semi-Diesel Engines." The paper is largely devoted to a description, with drawings and photographs, of the types of engines made by British manufacturers.

New Zealand Mineral Resources—The Geological Survey Branch of the New Zealand Department of Mines has issued Bulletin No. 23 (New Series) devoted to the geology and mineral resources of Western Southland. The clay, limestone, marl, and coal deposits are of importance. The bulletin is of eighty-eight pages, with maps and drawings, and may be obtained from the Government Printer, Wellington, New Zealand, for 5s.

Mining Methods—A twenty-nine-page paper describing the underground methods of mining the wide pyritic orebodies in the province of Huelva, Spain, is published in the December *Bulletin* of the Institution of Mining and Metallurgy (Cleveland House, 225, City Road, London, E. C. 1; price of the paper alone, 2s.).

Book Reviews

AT LAST a book on the metallurgy of zinc has been issued which looks as if it might be up to date and complete. Professor Hofman is the author, and the book is of the same style as his "Metallurgy of Copper" and "Metallurgy of Lead." We have turned it over, for review, to that veteran zinc metallurgist, George C. Stone, of the New Jersey Zinc Co., whose opinion, we feel sure, will be highly valued by our readers.

TO THOSE of our readers who read fiction only occasionally, and who, therefore, are not familiar with the merits of current books, we suggest "If Winter Comes," by A. S. M. Hutchinson. It is the best novel we have read for several years.

The Federal Reserve System—its purpose and work. Published in the *Annals* of the American Academy of Political and Social Science, Philadephia, Pa., for January, 1922. Price $1.

This 229-page collection of valuable papers written by eminent financiers, economists, and professors of banking deals with American currency prior to the passage of the Federal Reserve Act, the purposes of the act, and the operation of the system. To the business man or to any one equipped with a rudimentary knowledge of the working of the Federal Reserve System, a study of these papers will serve admirably to increase that knowledge. The engineer who may not be familiar with the subject will do better to read such a book as Professor Kemmerer's "A B C of the Federal Reserve System" before going into the details given in this volume of the *Annals*. As the governor of a Reserve bank states in the foreword, "It will not be easy reading; it may not be agreeable reading, but I think it mighty important that every business man should read it." It is well worth the time and trouble of close perusal.

Recent Patents

Platinum Recovery—No. 1,355,186. Russell Thayer, Philadelphia. Ores containing members of the platinum group are mixed with a halogen alkali-metal compound and water and heated to from 200 to 800 deg. C. The volatilized metals of the platinum group are caught in water and recovered by electrolysis. The process has not been operated commercially, but has been worked quite thoroughly in the laboratory.

Chloridizing — No. 1,403,516. Percy R. Middleton, New York, assignor of one-half to John C. Lalor, New York. A charge is made up of moist silver ore mixed with a heavy-metal chloride. This is dried and heated, thereby chlorinating the silver, which is subsequently extracted.

Flotation Agent—English patent No. 170,944, July 30, 1920. L. A. Wood, W. G. Sellers, and Minerals Separation, Ltd. Viscous oils such as coal tar, wood tar, blast-furnace tar, gas tar, fuel oil, and tar oil are neutralized with sodium hydroxide at 50 to 100 deg. C. and used either directly or as a base for a mineral flotation agent.

Molybdenum—No. 1,399,554. E. M. Hamilton, San Francisco, assignor to Hamilton, Beauchamp, Woodworth, Inc., San Francisco. Molybdenum ore or concentrate is ground, mixed with a solution of a non-volatile alkali metal and is heated to convert the molybdenum to a soluble compound. The material is then filtered and the valuable portion recovered from the filtrate.

Vanadium—No. 1,399,246. W. F. Bleecker, Boulder, Col., assignor to The Tungsten Products Co., Boulder, Col. Vanadium ores are mixed with an alkali-metal carbonate and water, the mixture is heated to a high temperature under pressure, the alkaline liquor separated from the product, the residue treated with an acid, the acid liquor filtered, and the vanadium-carrying slime removed from the residue.

Flotation—No. 1,398,989. E. W. Wilkinson, San Francisco, assignor to Minerals Separation North American Corporation, New York. An organic substance is subjected to partial decomposition in the presence of free oxygen and the mixed volatilized products are used for flotation. Patent No. 1,398,990 also covers the same subject, using a mineral frothing agent.

Ore Car—No. 1,399,746. A. Campbell, Chicago, assignor to Enterprise Railway Equipment Co., Chicago. A design for a single-hopper ore car with a central discharge opening.

Flotation Cell—No. 1,399,539. H. H. Bonnell, Denver. A V-shaped pneumatic flotation cell with a specially designed aërating apron and lift.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

One Hundred and Twenty-Fifth Meeting Of the A. I. M. E.

Arrangements Committee Successfully Carries Out Splendid Program—Joint Meetings With Mining and Metallurgical Society of America and Mining Section of National Safety Council

STAFF REPORT

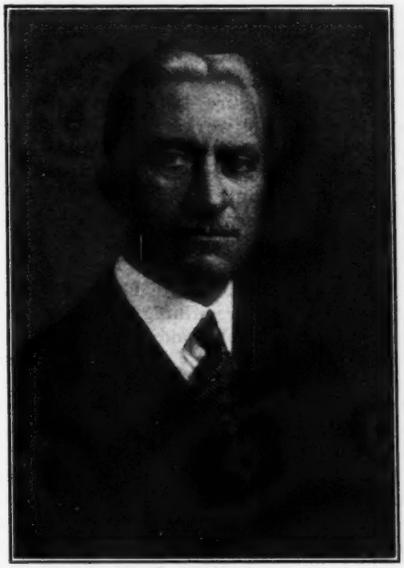
THE ONE HUNDRED AND TWENTY-FIFTH MEETING of the American Institute of Mining and Metallurgical Engineers, held in New York City Feb. 20, 21, 22 and 23, 1922, will go down in the annals as one which was particularly successful and outstanding. Certainly the Committee on Arrangements left nothing to be desired, and the work done reflects a great deal of credit on William Young Westervelt, chairman, and his able assistants. Considering the present status of the mining industries—which, although not completely in the doldrums, cannot be regarded as being in a palmy stage of existence—the attendance and interest were most gratifying to the officers and committees. There was in all a registration of about eleven hundred, and every section was represented. Weather conditions, with perhaps the exception of Thursday morning, when the visitors had been promised a view of the New York waterfront, were ideal, and even at that time there was so much crowded into a busy day that no complaints were made of the weather man's *faux pas*.

With the election of Colonel Arthur S. Dwight as president, the Institute has put into effect a plan that has been under consideration since the change was made in the name of the organization in 1919; that is, of having a metallurgical engineer as the guiding spirit.

Of the technical meetings, the greatest interest to the largest number was in the mining sessions which were under the leadership of John E. Hodge, chairman of the Committee on Mining Methods. At this time a definite plan was outlined for the future work of the committee, and it can be expected that this will form a most important part of the Institute's activities.

ACTIVE DISCUSSION IN MINING SESSION

Chairman Gottsberger, opening the Monday mining session, spoke of the valuable work of the Mining Methods Committee and the importance of the topic to be discussed, sampling and estimating ore deposits. John E. Hodge read an abstract of R. J. Longyear's paper, "Diamond Drill Sampling," and in a subsequent discussion remarked that the Mining Methods Committee was anxious to obtain the sentiment of the engineers of the Institute, respecting collecting and publishing separately the papers gathered by the committee. W. Y. Westervelt presented I. B. Joralemon's paper, "Sampling and Estimating Disseminated Copper Deposits," and pointed to one of the important conclusions reached by the author that a so-called factor of safety was not found necessary, extraction closely checking sampling.



COLONEL ARTHUR S. DWIGHT
President of the A. I. M. E.

J. Parke Channing maintained that "auto-salting" was almost always introduced in sampling and that a corrective factor was necessary. He enlarged on his practical experience in many branches of mining and urged the keeping of actual diamond-drill samples and accurate records of all drilling done. The sampling and estimating of Lake Superior iron ore deposits was covered by a series of papers by J. F. Wolff, E. L. Derby, W. A. Cole and R. W. Bowers.

Arthur Thacher, in presenting W. F. Boericke's paper, "Sampling and Estimating Zinc and Lead Ore Deposits in Mississippi Valley," showed how totally different was the problem confronting the sampling of those irregular bodies as contrasted with other vein deposits. He emphasized the widely varying results obtained by drilling and prospecting. A paper, "Organization of Mine Sampling at Anaconda," by W. B. Daly and F. A. Linforth, was next read by Mr. Daly, who outlined the methods used in Butte. The psychological element in sampling was discussed by the chairman, Mr. Channing, Mr. Packard, Professor Sperr, and Mr. Daly, the latter stating that at Butte the chief sampler's work was taken as a gage of the accuracy of other sampling.

The discussion during the entire session was interesting and valuable.

ELECTRIC HAULAGE FEATURE OF MINING SESSION

Discussion of electric haulage consumed most of the time at the mining session on the morning of Feb. 21, which was presided over by William Kelly. Charles E. Stuart read excerpts from his paper on "The Storage-Battery Locomotive as Applied to Mine Haulage." C. D. Woodward's paper on "Electric Haulage Systems in Butte Mines" was presented by Graham Bright. The proper field for the storage-battery locomotive and the principal causes of trouble experienced with it were the points about which the discussion centered. Among the participants was H. N. Eavenson. Mr. Bright said that, in his opinion, unless the operation were big enough to warrant the use of five or six storage-battery locomotives with a skilled man to look after them, the trolley type was best. Comment by G. B. Rosenblatt was read by Mr. Bright. C. D. Woodward's paper on "Power Distributing System for Deep Metal Mines" was read in abstract form.

The session closed with a brief discussion of W. O. Hotchkiss' paper entitled "Effect of Rate of Production on Profits." Mr. Hotchkiss said that engineers should familiarize themselves with Hoover's theory that an orebody to show the greatest profit should be worked out in the shortest practicable time. He gave as an example a hypothetical case where a monthly tonnage of 13,000 yielded a profit of 35c. per ton, the life of the mine being thirty-seven years and its present value $570,000, as against a profit of 85c. per ton from a monthly output of 25,000 tons, the life being fifteen and one-half years and the present value $2,055,000.

MINING METHODS COMMITTEE PRESENTS OUTLINE

The Tuesday afternoon mining session was presided over by E. E. Hunner. John E. Hodge, the first speaker, outlined the work of the Mining Methods Committee and gave a résumé of the progress made. Mr.

Hodge was followed by C. F. Jackson, of the M. A. Hanna Co., who explained a diagram which he offered for the consideration of members and the committee as a means of correlating the information sought by the committee. Arthur Thacher, speaking extemporaneously on the subject of "Mining Engineers," sketched the history and development of the profession and emphasized the relationship between the engineer and the labor with which he has to deal. F. W. Sperr, of the Michigan College of Mines, explained a classification of mining methods, following which Mr. Hunner presented the general outline that the Mining Methods Committee had prepared. Other papers included in the session were: "Spies Open-stope System of Mining," by S. R. Elliott; "Stope Cost Records and Mine Contracts of A. C. M. Co.," by C. I. Berrien; "Steam-shovel Operations at Bisbee, Ariz.," by H. M. Ziesemer and George Mieyr; and "Mining Methods at the Ashio Copper Mines," by M. Otagawa.

The mining session on Wednesday morning had a decidedly coal flavor, but was well attended by the metal men. An excellent discussion on the system of mining and the recoveries in the Pocahontas coal field, which was illustrated by lantern slides, was given by T. H. Clagett. This was followed by a paper presented by D. C. Ashmead, associate editor of *Coal Age*, "Can Anthracite Mines Be Operated Profitably on More Than One Shift?" This paper occasioned considerable discussion. Other papers covered in this session were: "Considerations Affecting the Extraction of Bituminous Coal in American Mines," by H. H. Stoek; "Mine Timber Preservation," by R. R. Horner and G. M. Hunt; "Underground Fire Prevention by the Anaconda Copper Mining Co.," by E. M. Norris, and "Mine Fires and Hydraulic Filling," by H. J. Rahilly.

Wire Ropes and Hoisting

There were three safety sessions, held jointly with the Mining Section of the National Safety Council. On Monday afternoon the subject of wire ropes and hoisting was considered. The first paper was that of W. N. Tanner and F. C. Jaccard, "Wire Ropes and Safety in Hoisting at the Butte Mines," which was read by W. B. Daly. One of the interesting features that was brought out is that all of the main shafts in Butte are provided with the "Lily" safety hoist control. Discussions of the paper were participated in by William Kelly, C. L. Colburn, Daniel Harrington, Robert Peele, Charles Locke, Graham Bright, B. F. Tillson, and Rudolf Kudlich.

The next paper read was by R. M. Raymond, on the subject "Safety Practice for Hoisting Ropes," which included the results obtained from a questionnaire, sent to operators, covering the class of rope used, specifications, methods, and other data. The information was of great interest, as were the recommendations made for safety practice in the use and care of hoisting ropes.

James F. Howe, of the American Steel & Wire Co., read an interesting paper on "The Use of Wire Rope in Mining Operations." He stated that improvement could be made in the manner of attaching the hoisting rope to a cage or skip, and classified the various methods used.

A reliable method of socketting recommends the use of zinc (we strongly suspect American Zinc Institute propaganda here), and this is described in Bulletin No. 75, U. S. Bureau of Mines. The last paper of this session was that of Rudolf Kudlich, which detailed safety devices for mine shafts and made a number of recommendations regarding safety practice in this particular.

Mine Ventilation Discussed

The second session, held on Tuesday morning, was presided over by H. F. Lunt, as was the Monday session. Daniel Harrington gave a résumé of his paper, "Efficient Ventilation of Metal Mines." Among the many interesting points mentioned, Mr. Harrington stated the "Failure to transmit fresh air currents to working faces is the most noticeable weakness of present-day metal-mine ventilation, and unfortunately this fault is only too frequent even where there is an abundance of fresh air in the main courses."

Mr. Daly summarized the paper, "Ventilation of the Butte Mines of the Anaconda Copper Mining Co.," which gave a résumé of conditions and the methods used there. J. J. Walsh, mine inspector of the Fourteenth Anthracite District in Pennsylvania, presented a summary of his paper, "Coal Mine Ventilation," and pointed out a number of instances of uneconomical practice in coal ventilation.

The safety session on Wednesday morning was more in the nature of a round-table discussion. Some exception was taken to the statement in C. A. Allen's paper, "An Inventory of Results of Accident Prevention in Utah," that the apprentice system be enforced. It was the general opinion of those present that the qualification of individuals, particularly those miners who had had experience elsewhere, should not be restricted. Discussion of the paper was participated in by Messrs Ryan, Walsh, Tillson, Charlton, Lunt, and Harrington. C. W. Goodale reviewed the paper prepared by himself and John L. Boardman on the "Bureau of Safety of the Anaconda Copper Mining Co." The paper "Electric Signal Installations in the Butte Mines," by C. D. Woodward, was summarized by Mr. Tillson.

Petroleum Sessions Cover Production and Marketing

The symposium on Foreign Oil Possibilities and on Petroleum and Gas proved productive of much interesting material. These sessions began on Tuesday morning and continued, with the necessary intermissions, until the close of the meeting on Wednesday. The addresses on the first day were confined principally to reports on the oil reserves of the United States and the Latin-American countries. Ralph Arnold, who acted as chairman of the meeting, was somewhat pessimistic as to Mexico, and declared that no wells of importance have been brought in in the light-oil belt of Mexico during the last year. The industry there, he pointed out, was struggling with the discouragements of high taxation and salt water. Other geologists seemed more optimistic, and indicated a probable extension of producing area north of Dos Bocas and south of Tuxpam.

The address of V. F. Marsters on the oil reserves of Peru and Ecuador was delivered on Wednesday, time not permitting on the preceding day. This was followed by a highly interesting presentation of suggestions for stabilizing the oil industry, by Henry L. Doherty. He pointed out how fluctuating prices were injuring the oil business and showed that more expensive fuels were often used because marketing conditions were more stable. These fluctuating prices, he said, could be blamed chiefly on the paucity of oil stocks. The market has not been regulated to stand the shock of suddenly increased production from new fields. Consumers usually carry smaller supplies of oil than of any other raw material. Mr. Doherty indicated as among the remedies of present conditions: more economical and efficient means of storing; more favorable legislation; better methods of salesmanship; and the arrangement for credit funds to provide for the storing of oil in requisite quantities. He then dwelt on the advantages of oil in certain places and processes and mentioned open-hearth steel furnaces as offering a great opportunity for extending the use of petroleum.

In the discussion following Mr. Doherty's paper, H. F. Bain stated that the Government had not done much toward stabilizing the oil business so far, but will no doubt increase its activities in this direction in the future. He mentioned the U. S. Navy stocks as having a stabilizing influence.

Frank Fueille read extracts from a paper prepared as a supplement to Bureau of Mines Bulletin 206 "Petroleum Laws of All America." There is a tendency in Latin-American countries, he said, to adopt the Turkish system of legislation, which is considered a retrogression. Bolivia, Ecuador, and Peru have issued comprehensive petroleum laws since Bulletin 206 was issued, and the essentials of these were given. Panama is also soon to issue a new code. The development of petroleum resources in Latin American will be slow until the laws are more favorable, in the opinion of Mr. Feuille. Discussion disclosed the fact that the Philippine laws are more drastic and immoral than those of almost any other country in the world, though it was brought out as a redeeming feature that

oil has not yet been produced there, and that the intending developer goes into the country with his eyes open.

Lester H. Woolsey then told what the U. S. State Department could and could not do in furthering American interests in foreign fields. The powers of the Secretary of State are somewhat limited, but his good offices may be taken advantage of in many ways, nevertheless.

Guests Address Industrial Relations Group

Robert Linton presided at the Industrial Relations Session on Tuesday evening. Dr. George F. Kunz, in presenting his paper, "Preservation of Natural Scenery and Attractiveness of Mining Camps," decried the useless destruction of the natural beauty of some mining camps and illustrated his lecture with lantern slides showing attractive natural scenery in America and abroad. Mr. Gottsberger was next asked to report for the subcommittee on Housing and Recreation of the Committee on Industrial Relations, and urged a greater interest in the human side of industry. Various other subcommittees reported—Dr. Sayers, of the U. S. Bureau of Mines, on "Prevention of Illness," T. T. Read on "Mental Factors in Industry," H. F. Lunt on "Safety," and Sidney Rolle on "Employment." In the discussion which ensued, Dr. Kunz suggested that the mining companies devote more attention to obtaining suitable cemeteries for their employees as a means for holding them together. Mr. Gottsberger said that where this had been done and where companies attempted too much regulation the charge was often made that the company handled the lives of the miners from the cradle to the grave.

The chairman introduced Mr. Hicks, of the Standard Oil Company of New Jersey, who related the successful experiences of his company with industrial representation. Mr. Elton, in charge of rehabilitation work in New York State, was invited to talk on the rehabilitation of cripples and cited examples of what could be done in that direction.

Non-Metallics Standardization Urged

There was considerable discussion of papers presented in the Non-Metallic Session, Wednesday morning, presided over by Prof. Heinrich Ries. R. B. Ladoo presented W. M. Weigel's paper, "The Non-Metallic Filler Industry," and Oliver Bowles his paper, "Undesirable Diversity in Non-Metallic Mineral Products." Dr. G. C. Stone remarked that a great variety of non-metallic products entered into tire manufacture and commented on the reluctance of manufacturers to give information concerning the properties given to the tires by the use of various non-metallics. It was generally agreed that standardization was greatly needed in the industry, and that it would work to the advantage of both producers and consumers. Dr. Stone then suggested the A. S. for T. M. for that purpose, and said that success had usually attended efforts to bring producers and consumers together on standards committees. The subject of standardizing screen tests was also broached. W. C. Phalen in a written discussion also suggested the standardization of machinery used in non-metallic mineral processes.

On Wednesday afternoon the A. I. M. E. held a joint meeting with the Mining and Metallurgical Society of America on a subject in which both societies have taken a great deal of interests—"Waste in the Mining Industry." Owing to the absence of Mr. Spurr in San Francisco, H. F. Bain discussed the waste involved in preliminary investigation of mineral deposits. Mr. Bain is one of the best extemporaneous speakers we have ever heard. He advocated a freer interchange of reports on mining properties, so that unnecessary re-examinations of prospects would be discouraged.

Economic Discussions in Joint Session

Pope Yeatman read an exhaustive paper on "Factors in Management of Mining Properties Which Lead to Loss and Waste." This is a truly admirable presentation of the problem which it will pay all mining engineers to digest when it appears in printed form, when it will be much more easy to assimilate than it was when read. W. R. Ingalls read a paper on the economic side of waste in the mining industries, which provoked some discussion from representatives of the coal industry. Edwin Ludlow followed with an address on "Waste in the Coal-Mining Industry," wherein he showed that conditions are far from ideal in the bituminous field and that the solution lay in a further limitation of the number of producing properties, so that those which are active can operate on more nearly full time. Anthracite production is more centralized in the hands of large producers who have carried out refinements having for their object increased efficiency.

The work of the Entertainment Committee, under the chairmanship of Albert C. Ludlum, received a high mark of approbation for the excellent staging of the smoker on Monday night. Amid a woolly, wild Western, pre-Volstead setting, this part of the entertainment started with a bang, and continued to fill in a most enjoyable evening. Certainly there was nothing lacking in variety. Through the courtesy of the Westinghouse Company an amplifier had been placed in the room and the necessary connections made so that members and their guests "tapped in" on various musical and other features that were relayed from the main office of the company. Several communications of direct and personal interest to Institute members were also received from South Africa, Paris, San Francisco, and other points through the medium of the amplifier.

Alkali Ike and Rattlesnake Pete, in true Western (cowboy) attire, performed a number of card tricks, orations and vocal selections. The use of a screen (in addition to that already provided by the smokers) aided considerably in the community singing, and was also effective in presenting the efforts of various members as limerick writers. The hand-painted majolica cuspidor, which was offered by the committee for the best poetical effort, was awarded to Lawrence Addicks. Light refreshments, of a most acceptable order, completed the program.

On Tuesday evening, before a large audience, the drama of "Mexico and Its Oil," and "Through India With the Duke of Connaught," in motion pictures, were presented. Both were highly interesting, the latter especially so, including glimpses of the beautiful Taj Mahal, a tiger hunt, and native life in India, as well as technically interesting exhibits of the Tata Iron & Steel Works, and the crookedest railway in the world (Mount Tamalpais not excepted?). After the picture an informal dance was held, with the men greatly outnumbering the ladies and in that respect not unlike dances we have attended in Western mining communities.

Committee Dinners and Luncheon

A number of committee dinners and luncheons were held throughout the sessions, which provided excellent opportunity for the transaction of such business as could not be conveniently carried on at other times. We are much in favor of such procedure, not only because much time can be thereby saved, but the gatherings are particularly conducive to good fellowship and actual accomplishment. On Monday, dinners were held by the following: Executive committee and past officers of the Institute of Metals Division, at the Engineers' Club; Petroleum and Gas Committee at the Harvard Club, and the Industrial Relations Committee also at the Harvard Club. Tuesday, lunch of Mining and Metals Committee at the Engineers' Club. Wednesday, lunch of Iron and Steel Committee at the Engineers' Club. Thursday, dinner of Milling Methods Committee at the Engineers' Club.

Exceptional Attendance at Banquet and Ball

There were over six hundred members and guests in attendance at the annual banquet on Wednesday evening at the Pennsylvania Hotel. This attendance, we were told, is the second largest that has been present at a similar function in the history of the Institute. The arrangements were well ordered and carried out by the Dinner Committee, under the chairmanship of Donald M. Liddell. The toastmaster's chair was ably filled by George Otis Smith, who explained in quite a satisfactory manner just exactly why he had been selected for that honor. He introduced Edward Ludlow, the out-going

president, and Mr. Ludlow, providing a precedent, gave an account of his stewardship of the organization during the last year. He pointed out particularly the expansion in the formation of new local sections of the industry and emphasized the necessity of keeping up the interest of individual members in their own sections as a means of increasing the scope of the parent body. Colonel Arthur S. Dwight, the newly elected president, in his address, pointed out particularly the place that the mining engineers must take in public affairs. Following Colonel Dwight's address, the tables were removed and dancing began. This continued until an early hour, but as is characteristic of the mining engineer, it was evident that such a display of strenuousness made but little difference, for the attendance at the excursions the following morning suffered no discounting.

Crucible Steel Excursion

The first stop of the excursion train out of Jersey City on Thursday morning was made at Newark, where a large number took advantage of the opportunity to visit the Atha works of the Crucible Steel Co. at Harrison. The chief points of interest were the six-ton Heroult electric furnace, from which a charge of Monel metal was being poured, and the wire mill. The plant as a whole is only working about 25 per cent capacity, many departments, chiefly those equipped during the war for munition manufacture, being closed.

Bayway Refinery of Standard Oil

The second stop was made at the Bayway plant of the Standard Oil Co., and here a well-arranged schedule enabled the visitors to cover the various departments. The party was divided into five groups, and each was taken to one of the departments and thence through the entire plant. Production at this refinery consists of gasolene, kerosene, fuel oil, and paraffine, the oils treated consisting mostly of Mexican and some of the Mid-Continent oils. The following comprised the departments visited: Boiler house, crude coking house, continuous crude house, pressure stills, crude treating house, continuous treating plant, steam stills, steam and fire stills, and paraffine department.

Chrome Excursion Memorable

About 125 people visited the refinery of the U. S. Metals Refinery at Chrome, N. J. Guides were provided to escort small groups through the entire plant. It was evident that every effort had been made by the operating officials to make the various processes used in the plant clear to inquiring guests through the lavish use of explanatory samples, charts, and models—a feature greatly appreciated by the ladies. Each visitor was supplied before leaving the plant with a miniature copper ingot and a beautifully prepared booklet containing views of the refinery, and all brought away the memory of unexcelled industry hospitality.

Following the assembling of the three groups on the train and the completion of the journey to Perth Amboy, the visitors were entertained at lunch by the industries of that city. The sight-seeing of the morning was of a fairly strenuous order, and previous to the arrival of the entire party at Perth Amboy some doubts had been expressed as to whether sufficient food would be available. But there remained no question on that score, for a meal of the most substantial order was served at the Y. M. C. A. by a committee composed of the local women. At the conclusion of the lunch short addresses were given by A. C. Clark, of the Raritan Copper Co., vice-president of the industrial association of Perth Amboy, and President Dwight and A. R. Ledoux, of the Institute.

In the afternoon visits were made by various groups to the copper-fabricating plant of the Standard Underground Cable Co., and the copper-refining plant of the Raritan Copper Co., both at Perth Amboy, and the roofing plant of the Barber Asphalt Paving Co. and the refractory plant of Henry Maurer & Son at Maurer, N. J.

For the Ladies

A separate program for the ladies had been prepared by a committee of which Mrs. A. S. Dwight was chairman. Monday's activities included conducted visits to several points of interest, most of the visitors electing to go either to Tiffany's, where they enjoyed the sensation of toying with thousands of dollars' worth of Oriental pearls, or to the Hotel Pennsylvania, where they marveled at the magnitude, order, and cleanliness of the household arrangements. In the late afternoon Mr. and Mrs. Ludlow entertained at a reception at the new Ambassador Hotel, which was largely attended, even some of the gentlemen availing themselves of the president's hospitality. That London thriller, "Bulldog Drummond," attracted many to the Knickerbocker Theater in the evening.

Tuesday a delightful time is reported at the residence of Mrs. George D. Barron, at Rye, N. Y., where a luncheon was served, followed by cards. In the evening moving pictures at the Institute headquarters were followed by an informal dance. The business meetings of the Woman's Auxiliary were held the next day. In the afternoon Senator Clark held a reception at his galleries, which attracted many ladies and gentlemen and proved as thoroughly enjoyable as it has in former years. The dancing at the Hotel Pennsylvania in the evening, following the banquet, provided the one opportunity to appear in evening dress.

The ladies were well represented on the special excursions to industrial plants on Thursday, and many preferred the sightseeing in the afternoon even to the allurements of tea and cards at the Raritan Yacht Club.

The convention was in every sense an unqualified success. Professionally and socially it conformed to previous high standards.

Oil Drilling Expensive in Isolated Fields

To Encourage Development, Government Requires No Royalty on Small-Scale Production on Alaskan Public Lands

The cost of oil-drilling operations in remote and isolated fields may easily amount to ten times that of similar operations in favorably situated producing oil fields in the United States, declared A. W. Ambrose, chief petroleum techologist of the U. S. Bureau of Mines, before a recent gathering of Pan-American diplomats in Washington. It is probable that the first well drilled by one of the prominent producing companies in Colombia cost not less than $500,000, said Mr. Ambrose, whereas the average well drilled to the same depth in a proven field in the Mid-Continent district of the United States would not cost $50,000.

This factor of excessive cost of production should be taken into account in the consideration of policies designed to encourage the development of an oil industry in regions or countries where the petroleum resources have not yet been exploited, Mr. Ambrose declared further. The Government has recognized this fact in trying to encourage development of the remote oil possibilities of Alaska. For example, the royalties are much higher on oil produced on the public lands in the oil fields of the United States, where there are good railroad facilities, and where a network of pipe lines gives a ready outlet to the refineries, than in Alaska, where railroads are scarce and no pipe lines or refineries exist.

For the first five years the Government does not charge any royalty unless the wells on each tract in the public lands of Alaska average 100 bbl. per day per well or more. Should the average production be greater than this, the Government exacts a royalty of only 5 per cent. During the second five years of operation the Government charges a royalty of 5 per cent on all the oil produced, and during the succeeding ten years a royalty of 10 per cent, which is the maximum that an operator ever has to pay. Other lenient features have been provided to encourage oil development; for instance, during the first five years no rental is charged. It is interesting but disconcerting to note that despite these attractive features little if any drilling will be done in Alaska during 1922.

Much prospectively valuable oil land in the Latin-American countries is at present almost inaccessible because transportation of the needed tons of drilling and camp equipment and other supplies is practically impossible. The expense of building roads to overcome this difficulty is a considerable factor in the high cost of oil production in the tropics. The establishment of the absolutely essential sanitation is generally another expensive proposition. Furthermore, the establishment of fully equipped machine shops and forges is necessary in an adventure of this kind.

High salaries must usually be paid to workers as compensation for unfavorable living conditions in such localities. The matter of pipe-line transportation to ports is also a serious cost factor.

In general, Mr. Ambrose declared, the success of an enterprise in a remote and unexplored territory will depend primarily upon the strength of the organization attempting the development, and on the skill and knowledge of its responsible members. For that reason only the strongest established companies are in a position to interest themselves in exploiting areas particularly remote. This is readily appreciated when it is considered that in this type of work the area is far removed from the manufacturing centers and consequently from the centers of oil-well supply manufacturers; also if oil is found, it must be transported and marketed, all of which requires much capital.

MEN YOU SHOULD KNOW ABOUT

Rush T. Sill, mining engineer, of Los Angeles, recently examined property near Randsburg, Cal.

J. K. Turner, mining engineer, of Goldfield, Nev., is in Oatman, Ariz., on professional business.

W. J. Loring left San Francisco recently on a business trip to Boston, New York, and Washington.

George Gray has resigned his position as manager of the Canadian Association Goldfields of Larder Lake.

Robert F. McElvenny, manager of the American Smelting & Refining plant at Omaha, was a visitor in Colorado recently.

Henry C. Carr, who has been investigating mineral deposits in Brazil during the last six months, has returned to New York.

Luther W. Lennox is mill superintendent of the Veta Grande unit of the American Smelting & Refining Co., at Parral, Chihuahua, Mexico.

W. H. Blackburn, general manager of the Tonopah Mining Co., has returned to Tonopah from a business trip to the Mother Lode district in California.

James F. McCarthy, of Wallace, Idaho, president and manager of the Hecla Mining Co., is in Milwaukee attending a meeting of the directors of the company.

Walter S. Weeks will discuss mine ventilation at the meeting of the San Francisco Section of the American Institute of Mining and Metallurgical Engineers on March 14.

Frederic Keffer, formerly manager of the Canada Copper Co.'s Boundary, B. C., operations, is recovering at his home in Spokane from an operation performed during February.

Frederick Burbidge, of Wallace, Idaho, general manager of the Federal Mining & Smelting Co., is inspecting the zinc-mining operations of the company at Baxter Springs, Kan., and Picher, Okla.

F. J. Katz, who has been in charge of mineral statistics for the Bureau of the Census during the time that the 1920 returns were coming in, has completed that work and will resume his duties with the U. S. Geological Survey. He specializes in work on abrasives and on metallics generally.

F. J. KATZ

H. A. Megraw has resigned as engineer for the Kennedy-Van Saun Manufacturing & Engineering Corporation, of New York, to become vice-president and treasurer of the Crown Oil & Wax Co., of Baltimore, Md.

Lieutenant Colonel John G. Barry, formerly of the geological department, Massachusetts Institute of Technology, and now mining geologist and engineer of El Paso, Tex., recently returned after completing an extensive geological study in the region of Parral, Chihuahua, Mexico.

E. J. Donohue has resigned the position of general manager of the Britannia Mining & Smelting Co., after having been with the company for about nine years. Having entered the service of this company in the early years of its enterprise on Howe Sound, B. C., he has been closely identified with its development and expansion. Mr. Donohue feels that his health demands a prolonged rest, and so has asked to be relieved of the responsibilities of his office.

Mining and metallurgical engineers visiting New York City last week included: **W. B. Plank**, Easton, Pa.; **Herbert W. Smith**, Washington, D. C.; **Paul R. Cook**, Bulgaria; **C. F. Jackson**, Cleveland; **Harrison Souder**, Cornwall, Pa.; **W. R. Chedsey**, State College, Pa.; **Richard R. Smith**, Bolivia; **R. R. Wilson**, Victoria, B. C.; and **Francis Nicholson**, Charlotte Court House, Va.

SOCIETY MEETINGS ANNOUNCED

The Association Alumni of the School of Mines at Liege, Belgium, will celebrate their seventy-fifth anniversary by an international scientific congress to which are invited the engineers of Belgium and the allied countries. The congress will consist of seven sections, mines, metallurgy, mechanics, electricity, chemical industries, civil engineers, and geologists. In the course of the session of the congress, papers will be presented which will be published by the *Revue Universelle des Mines*. Further information may be had by addressing, O. Lepersonne, Secrétaire Général, de l'A. I. Lg., 16, Quai des Etats-Unis, à Lié, Belgium.

OBITUARY

George P. Harrington died recently in Los Angeles at the age of seventy-four. He was for years engaged in mining in the Crown King district of Arizona.

J. A. Bauer, who went to Arizona in the early days of Tombstone, and who was later connected with the management of the Hill Top mine, in southeastern Arizona, died recently from heart disease in a Douglas hotel.

Schuyler Lawrence, for many years a resident of Chihuahua, Mexico, died Jan. 9 at Mysox, Pa. Mr. Lawrence was interested in a number of mining properties near Santa Eulalia. He was a member of the A.I.M.E. and the A.S.M.E.

Frederick Corkill died in Oakland, Cal., on Feb. 13 at the age of sixty-five. He was at one time foreman of the Northern Belle mine, at Candelaria, was later superintendent of the West End mine, at Tonopah, and in recent years has been in the employ of "Borax" (F. M.) Smith as field and consulting engineer.

George Robert Smith, member of the Legislative Council of Quebec, died at Thetford Mines, Quebec, on Feb. 20 at the age of sixty-two years. Mr. Smith was born at Newark, N. J., and went to Canada to engage in the mining industry. He became interested in the development of the asbestos deposits of Quebec, and was president and general manager of Bell's Asbestos Co., Thetford mines, and vice-president and general manager of the Asbestos Manufacturing Co., of Montreal. Mr. Smith was one of the founders of the Canadian Mining and Metallurgical Institute, of which he was president for some time. He took an active part in public affairs, and in 1911 was appointed a member of the Provincial Legislative Council.

THE MINING NEWS

The Mining News of ENGINEERING AND MINING JOURNAL is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

Leading Events

Patents for treating copper ore so as to recover the copper in oxidized minerals, either alone or in the presence of sulphide copper, have been awarded to Milton F. Webster, following litigation.

The American Smelting & Refining Co. has deferred its annual meeting from April until June.

Phelps Dodge copper is to be refined at the A. S. & R. Co.'s Perth Amboy refinery beginning next fall, instead of at the Nichols Copper Co.'s Laurel Hill plant, as in the past.

Rumors that the Rio Tinto Co., Ltd., may pass its next dividend also, as it did its last, are in circulation abroad.

The outcome of the British America Nickel Corporation's enterprise is linked with a bank failure in Norway in the Norwegian press, according to foreign correspondence.

Copper Ore Treatment Patents Awarded to Webster

Process Seeks To Recover Metal in Oxidized Minerals in Presence of Sulphides—Assigned to Merrill Co.

A recent decision of the Court of Appeals of the District of Columbia awards to Milton F. Webster patents in what promises to be an important ore-treatment process. The process has for its purpose the recovery of the copper in oxidized copper minerals, either alone or in the presence of sulphide copper minerals. A dilute solution of sulphuric acid is first used to dissolve the copper present in oxidized form in a finely ground pulp. Finely divided iron is then added and the copper is precipitated in the pulp. The metallic copper and the sulphides are then recovered by subjecting the pulp to flotation. The steps in themselves are not novel, but the combining of them and the precipitation of the copper in the pulp are original and lead to important results in the treatment of a type of copper ore which has given considerable trouble to metallurgists.

Milton F. Webster worked on leaching oxidized copper ores at Butte, Mont., and, owing to difficulties in the separation of the acid copper solution from the pulp, evolved the idea of precipitating the dissolved copper in the pulp as metallic copper, when the separation would be easily accomplished. Later, some experimental work was done at the East Butte Copper Mining Co.'s plant, with encouraging results.

Mr. Webster attempted to interest different people in the process, but without success until Charles W. Merrill realized its possibilities. It being found that others had filed application for the process, interference proceedings in the Patent Office were begun and the ensuing litigation was carried to a successful conclusion. The process has been assigned to the Merrill Co., of San Francisco, for commercial exploitation.

Australia To Continue Control of Base Metals

By Cable from Reuters to "Engineering and Mining Journal"

Melbourne, Feb. 23—With a view to frustrating any possible attempt on the part of Germany to regain control of the Australian base-metals industry, the federal government has renewed the war-time restriction on the exportation of certain minerals and on the export of gold in specie or bullion without the consent of the federal treasurer.

Phelps Dodge Copper Refining To Be Done at Perth Amboy

Copper produced by the Phelps Dodge Corporation will be refined by the American Smelting & Refining Co., beginning this year, instead of at the Laurel Hill refinery of the Nichols Copper Co. as in many years past. A contract consummating the arrangement has been signed by the two companies. The metal will be handled at the Perth Amboy plant of the American Smelting & Refining Co., in New Jersey. A clause in the contract will permit the Phelps Dodge company to lease this plant, if it desires to do so. The refinery has been closed down for over a year.

New Seneca Board Slated

At the annual meeting of the Seneca Copper Corporation to be held March 8, a new board of directors composed of the following will be elected: W. F. Bartholomew, of Boston; R. N. Atwater, Jr., J. Parke Channing, Thomas F. Cole, Joseph Deering, W. B. Anderson, Robert Linton, and Walter Lewisohn, all of New York, and George A. Tomlinson, of Cleveland, Ohio.

Frederick Lewisohn, Hamilton Fish, and E. C. Westervelt will retire as directors. Their successors will be R. M. Atwater, Jr., of Ladenburg, Thalmann & Co.; Robert Linton, president of North Butte Mining Co., and George A. Tomlinson. There will be no contest over the election, it is said.

American Smelting & Refining Co. Postpones Annual Meeting

Stockholders' Investigation Committee Defers Report—Draws Fire of Karl Eilers

The board of directors of the American Smelting & Refining Co. has by amendment of the bylaws postponed the date for the holding of the annual election of directors from April 4 to June 27. This action has been taken with the assent of the stockholders' committee of investigation.

The committee has advised the stockholders that its work of investigation has practically been completed. "The committee," it states, "is under obligation to submit its findings to, and desires to secure the criticism and suggestion of, Senator Root, and as the Senator, because of duties in Washington, has been unable at this time to give the matter consideration, the committee will be unable to make its report to stockholders until later, but expects to have its report sent to stockholders so that they may have the benefit of a statement of facts founded upon the work of investigation in ample time for their consideration before the annual meeting."

Karl Eilers, who was active in opposing the Guggenheim management a year ago, commented on the announcement of the postponement as follows:

"It is particularly significant that the meeting should be postponed in order to afford an opportunity to submit the proposed report of the stockholders' committee to Senator Root, who is of counsel for the Messrs. Guggenheim and who also has been retained in this matter by the smelting company. It would be interesting to know just what are the findings of the committee which require the comments and explanation of Senator Root, the counsel for the Messrs. Guggenheim, before being permitted by the company to be seen by their stockholders." Mr. Eilers is one of the chief individual stockholders of the company.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Seek To Prevent Waste of Oil and Gas

Appropriation Asked To Permit Investigation by Bureau of Mines—Government Aid Favored by Bain

Representative Jacoway, of Arkansas, recently appeared before the House Appropriations Committee in behalf of an appropriation of $15,000 for investigations by the Bureau of Mines to prevent waste in drilling and producing oil and natural gas in that state. He said there were 110 wells in the El Dorado field producing 40,000 bbl. daily, but that there was trouble with water getting into the wells. Representatives Cramton, of Michigan, and French, of Idaho, suggested that the state conduct the work or that private interests contribute. Mr. Jacoway said that if the matter were left to private interests or to the state, much of the oil resources would be wasted.

Director Bain, of the Bureau of Mines, favors Government assistance for the reason that new wells will probably be discovered in Arkansas, which may involve new problems. Demonstrations by Government specialists would be helpful, he said. He referred to numerous co-operative agreements under which private interests furnished funds for work and opposed a suggestion of Representative French that all Government work be based on financial assistance from outsiders, as sometimes outsiders would not request it and it frequently is necessary for the Government to do work on private lands, particularly those adjoining Government wells.

As to co-operative agreements, Director Bain referred to the fact that oil companies in Wyoming had contributed $47,000; Oklahoma had contributed $37,500 for oil and gas work; Colorado $14,000 and Utah $3,000 for oil-shale work; the Shipping Board $1,800 for fuel-oil analysis; the Mid-continent Oil & Gas Association $1,000 for gas-burner investigations, and the Navy $15,000 for supervision of operations on naval reserves. He pointed out that persons developing oil usually lack engineering experience. Mr. Bain said that oil producers individually are not always in full sympathy with the conservation program of the Bureau.

The Bureau is more concerned, he said, in computing back oil royalties and supervising drilling operations in known pools under the leasing law than in checking up oil operators to determine if they are drilling in the time required by law. He said that the Navy is working on a plan to store above ground a large quantity of fuel oil obtained from naval reserves.

War Mineral Relief Claim Recommended

One award was recommended by the War Minerals Relief Commission during the week ended Feb. 25. It was in the case of Howard M. Maple, of El Paso, Tex. The commissioner recommends the payment of $7,565. The amount claimed was $12,065. The mineral involved in the claim is manganese.

Ore Carrying Corporation a Common Carrier

The Interstate Commerce Commission has ruled that the Ore Carrying Corporation of New York is a common carrier subject to the Interstate Commerce Act and that it may lawfully receive divisions of joint interstate rates from its trunk-line connections.

The entire capital of the Ore Carrying Corporation is owned by Witherbee, Sherman & Co., a corporation engaged in mining and selling of iron ore, pig iron, phosphates, and other materials. It transports property by water, it is shown in the statement to the Interstate Commerce Commission, between points in the State of New York and points in New Jersey from New York Harbor to various points on Lake Champlain.

Government's Silver Purchases 94,351,628 Oz.

Purchases of silver by the Bureau of the Mint during the week ended Feb. 25 amounted to 165,000 fine ounces. This brings the total purchases under the Pittman Act to 94,351,628 fine ounces. The total amount of silver that is to be purchased under the terms of the Pittman Act is 208,000,000 oz.

Mexico's Precious-Metal Output Decreases Slightly

Production of silver in Mexico in 1921, as given by the Ministry of Industry, Commerce and Labor, was 2,005,143 kg. Gold production was 21,275 kg. This is only slightly less than the production in 1920, when the country produced 2,068,938 kg. of silver and 22,864 kg. of gold.

The minister in charge of the department, in giving out the preliminary figures for 1921, said the country had reason to be proud of the 1921 record, which almost equaled that of the boom year of 1920. Simultaneously with the announcement of the annual figures, the production figures for December, 1921, also were given. During that month silver production was 211,286 kg. and gold production 1,952 kg.

Free List for Zinc Approved by Some in Washington

Ills of Industry Too Deep To Be Cured by Tariff, It Is Held by Certain Specialists

The reported decision of the Senate Finance Committee to put zinc on the free list meets the approval of some of the metal-mining specialists in Washington. They believe the refusal of the committee to adopt the high rate of duty urged upon them will do more than will any other one thing to alter the character of the zinc industry from one satisfied to be self-contained to one, comparable to the copper industry, based on exports. They point out that copper formerly was on the dutiable list, and that it took strenuous efforts on the part of the industry to get it on the free list so that it could not be accused of hiding behind a tariff barrier and so that the access of its product to foreign markets might be facilitated. The ills of the zinc industry are too deep to be met by a tariff, they further maintain.

Nitrates 7 Per Cent of Panama Tonnage

Of the 435,943 tons of freight which passed through the Panama Canal during December en route from the Pacific to the Atlantic, 59,957 tons consisted of nitrates. Shipments of crude oil totaled 4,723 tons for the month; ores, 9,805 tons; metals, 10,959; and phosphates, 8,900. The total tonnage moving from the Atlantic to the Pacific during December was 517,110 tons. The tonnage of crude oil was 48,272 tons; coal and coke, 46,462 tons; metals, 22,007; and sulphur, 4,000 tons.

Regret Loss of Non-Metallics Appropriation

Though the Bureau of Mines fared better than did most bureaus at the hands of the Appropriations Committees, the loss of the $35,000 intended for the continuance of the work on non-metallic minerals is particularly regretted. A large amount of work had been done in the one year that this appropriation was available.

Patent Office Relief Bill Signed

The President signed the Patent Office Relief Bill on Feb. 18. As the bill carries only the authorization for the appropriation, the reorganization and installation of additional personnel must await the actual granting of the money. It is probable, however, that the appropriation can be carried in a forthcoming deficiency bill.

NEWS BY MINING DISTRICTS

London Letter

Aid for Dolcoath Tin Mine Sought Under Trade Facilities Act— Rio Tinto May Pass Dividend Again

BY W. A. DOMAN

London, Feb. 4—Cornish mines die hard. They have their difficulties, both in the way of mining and of raising additional capital, but hope evidently springs eternal in the breasts of the Cornish mining engineers. It was thought some time ago that the misfortunes of the Dolcoath were almost too great to be overcome. But no. Attempts are being made to give this grand old property another chance. It is in a worse way financially than technically, and it is the former aspect that is under consideration.

At the present price of the metal no one will subscribe capital for a Cornish tin-mining company. It is felt, however, that prices will not always remain at their present level, and that some effort should be made to relieve the distress among the workers in the Duchy. The directors of the Dolcoath, therefore, are endeavoring to gain some benefit under the Trade Facilities Act of November last. According to the provisions of this act, the Treasury may guarantee loans and interest, and application has been made for the guarantee of a capital sum and interest thereon sufficient to carry out a modified scheme of development of the northern areas of the property. If the money can be obtained, a new shaft will be sunk between the North and South Roskears, and the South Roskear mine will be unwatered. Until the receipt of the Treasury reply, nothing can be done, but it is hoped the company will come within the scope of the act.

Rumor is not always to be trusted, because it is so frequently set in motion for interested purposes. Nevertheless, a story concerning the Rio Tinto has got into circulation, and, being so far uncontradicted, is worth mentioning. It is said that the price of sulphur has fallen heavily on account of the keen competition of Norwegian companies, and that, as a result, the company may again have to pass the dividend, and, further, it may be under the necessity of making an issue of debentures. The Rio Tinto has had such a remarkable history that this turn in its affairs, if correct, is most unfortunate. The French public are the principal holders of the shares.

John A. Agnew has been appointed a director of the Consolidated Gold Fields of South Africa and of the New Consolidated Gold Fields, in the place of Major Sapte. Mr. Agnew has an established reputation, and in appointing him to pay special attention to the technical side of the Gold Fields business the directors have made a good move, and one that will be unquestionably popular. The opinion has been expressed by various shareholders that new blood was required in the management.

While indications are not wanting that the strike of white miners on the Rand is coming to an end, the evils resulting from the cessation of operations are already beginning to make themselves apparent. The New Goch and the Roodepoort United have already closed down, never to reopen, and now an announcement is made that the existence of the Luipaards Vlei is jeopardized. The company has been living from hand to mouth for some time, and the expense of keeping the mine free from water during the cessation of operations would have exhausted the limited resources of the company. As a result, the mine is being closed down. Presumably, the company will not go entirely out of existence, for one part of the property on which the East Battery Reef has been worked, and on which expenses would be relatively low, may be reopened. No hope is held out, however, of anything in the nature of substantial profits accruing from the working of this area.

Object to Changing Mount Massive's Name

A special meeting of the Leadville, Col., Chamber of Commerce has been held to protest against the action of the U. S. Geographic Board in designating the highest point of Mount Massive as "Gannett Peak." In 1901 an effort was made by the U. S. Board of Geographic Names to change the name of this peak to Mount McKinley, but the change was resisted by the Society of Leadville Pioneers, who in their remonstrance said in part:

"To us, Mount Massive represents more than the attributes of any human entity. In frontier days we washed its feet, gleaning a harvest of golden sands. Later we drove our steel into its rocky heart and wrestled wealth from its concealment there. In decades past our camp fires scattered increase o'er its breast. For many years our eyes have watched the sun chase shadows in the morn adown its rugged sides, and shadow follow sunshine to its topmost peak at close of day. In early times it was a landmark from afar to guide us to our cabin hearths. Our children, and our children's children, first learned its name from oft-told tales of our adventurous lives. God's acre, where our brothers and our loved ones sleep, nestles within its keeping. Mount Massive is a name endeared to us by old associations, and is a heritage we would bequeath to after generations of our kindred. Therefore we plead for the retention of its ancient name."

Johannesburg Letter

Details of Strike Situation on Rand— Cost of an Ounce of Gold at Twenty-two Mining Properties

BY JOHN WATSON

Johannesburg, Jan. 24—The strike at the gold and coal mines still continues. No trams have been running in Johannesburg since Jan. 20, and the electric light is only available to a limited extent. As showing how the cost of production has gone up in the past eight years, the following figures are instructive. They are based on bona fide returns:

COST OF AN OUNCE OF FINE GOLD

Mine	Dec., 1921 s.	Dec., 1921 d.	Year 1913 s.	Year 1913 d.
Luipaards Vlei	110	10	73	3
Geldenhuis Deep	99	8	70	3
Durban Roodepoort Deep	99	3	71	2
New Goch	96	5	68	5
Randfontein Central	96	3	59	1
Village Deep	95	8	58	1
Simmer and Jack	94	11	47	5
New Kleinfontein	93	9	57	11
E. R. P. M.	93	5	53	0
Robinson	93	2	32	11
Wolhüter	92	8	58	2
Nourse	92	7	60	9
West Rand Consolidated	92	3	67	8
Roodepoort U. M. R.	92	2	81	1
Knight Central	91	3	75	3
Aurora West	91	0	63	0
Rose Deep	88	7	53	2
Witwatersrand	87	6	48	7
New Unified	86	11	58	7
Witwatersrand Deep	86	3	50	1
Consolidated Main Reef	85	8	57	5
Robinson Deep	85	7	50	3

The premium on gold is falling rapidly, and it is obvious that the above mines, under present conditions, are being worked at a loss. An industrial conference has now been sitting for ten days, under the chairmanship of Justice Curlewis. The question of the collieries was first discussed, then the condition of the Victoria Falls & Transvaal Power Co. This company generates power, locally, from coal and has never brought any power from the Victoria Falls, as the name might imply. It was only on Jan. 24 that the conference reached the main issue of the strike—that is, the gold-mining industry. None of the other matters in dispute has really been settled, except that the difficulty as affecting the town engineering shops is to be submitted to arbitration.

The loss to the community of South Africa caused by the strike is incalulable; but some idea may be formed from the fact that in 1920, on the Rand alone, close on £14,000,000 was paid for supplies to the gold mines.

BURMA

Namtu—During January, 16,468 tons of ore was milled, producing 10,527 tons of lead concentrates; and 9,234 tons of lead-bearing material was smelted, producing 3,465 tons of hard lead for treatment in the refinery. Refinery products were 3,202 tons of refined lead and 355,573 oz. of refined silver.

NORWAY AND SWEDEN

Effect of British America Nickel Enterprise — Metal Mining Industries Show Improvement

From Our Special Correspondent

Arbeider Politiken, a Norwegian paper, published recently an eight or nine column article purporting to explain the cause of the Söndenfjeldske Privat Bank's liquidation. "As is known," says the paper, "it was the connection between the bank and the A. S. Kristiansands Nikkel Raffinerings Verk that brought the former into difficulties," and the publication states, further, that in reality it was the association of the A. S. K. N. Raffinerings Verk with the British-America Nickel Corporation that caused the catastrophe. The paper has also communicated with Prime Minister Blehr on the subject and asked if the government is prepared to take measures to establish a public commission to inquire into the matter. The Premier replied that the government had taken measures to have the documents on the subject sent in, but could not state what steps may be taken after the papers were received. A decision would be reached when they had been examined. *Bergverksnyt* learns, later, that there is a majority of the government for a committee of inquiry. Verdens Gang has been informed by Admiral Börresen that the *Arbeider Politiken* article is a biased description of conditions. He refuted several of the points, and repudiated personal charges as groundless. In the meanwhile, a committee, chosen by the shareholders, will inquire into the matter; for which purpose they have, it is stated in the press, "all the cards on the table."

Mining activities remain in a stagnant condition in Norway, pending the expiration in the spring of the high tariff established three years ago by the Compulsory Arbitration Court, when the bulk of the industry suspended. There are signs, however, of animation in one or two directions, especially in the pyrites export line; and from the Orkla Mines, in Norway, where 700 men are employed. There has been a brisk shipment to Germany, Sweden, and in the super-phosphate works at Knarrevik. The total export figures for the eleven months of 1921 of ore low and rich in copper, respectively, were 47,325 tons and 118,625 tons, as against 75,346 tons, and 182,476 tons for the first eleven months in 1920. Of iron ore there was exported during the first eleven months of 1921 from Norway 2,884,099 tons, as against 1,461,717 tons in the first eleven months of 1920.

Of the 1,056,362 tons of Swedish ore in transit to the Norwegian port of Narvik during the first three quarters of 1921 there was re-exported 627,223 tons. In both countries every effort is being made to get the accumulated ore stocks out of hand. At the Sydvaranger mines, a property with an equipment book-entered at 54,600,000 kronen, nearly 5,000,000 tons of ore is still available. The Dunderland Iron Ore Co., Ltd., from all accounts, appears to be financially prepared to take up work again when the proper time arrives. In the meanwhile the company has received permission to postpone the regulation of the Reinsfossen Falls for twelve months.

The aluminum demand has again put the A. S. Höyangfaldene into working, with a reduced labor and staff tariff, and about 400 men have been taken on. The product is being exported to England, Germany, and Japan.

The latest silver figures available from the Kongsberg mines (for the month of December, 1921) give the output from Kongens grube, 200.5 kg.; Gottes Hülfe, 447.5 kg.; Gabe Gottes, 154.5 kg.; and Underberget (Samuel), 1,585.5 kg., or a total of 2,388 kg. From the Samuel mine there was an additional 60 kg. of coarse silver.

KOREA

Unsankinko—The Oriental Consolidated Mining Co. ran 160 stamps twenty-two days in December, crushing 16,908 tons. Gross receipts for the month were $104,247 and operating costs $97,349, giving an operating profit of $6,898. Of this $6,475 was put back in improvements, leaving a net profit of $423.

CANADA

British Columbia

Provincial Ore-Testing Plant Promised —Spring Rush Expected to Cedar Creek and Taseko Lake Areas

Victoria—A number of delegations have gone to Ottawa to interview the new Dominion Government with reference to problems affecting British Columbia. One of the matters taken up was that of the treatment of the complex ores of the Kootenay district. As a result of representations made, assurance has been received that $100,000 will be voted at the next session of the Dominion Parliament for the construction in the province of an ore-testing plant. It was argued by the Westerners that if ore-testing facilities were provided in this province, small-mine operators and prospectors who now are compelled to send their ore out of the province would be in a position to have it tested here.

Lillooet — Gold strikes having been reported in the Cedar Creek area, near the northeast end of Quesnel Lake, and at the south end of Taseko (Whitewater) Lake, a spring rush is expected. Considerable areas in both localities have been staked, and preparations are being made for the transport of men to the scenes of the strikes as soon as weather conditions permit. There will be little difficulty in reaching either field. The Cedar Creek strike lies forty or fifty miles from Williams Lake as the crow flies. By motor stage, via 150-mile House and Beaver Lake, at both of which points road houses have been established, it is only seventy-four miles, a journey which an automobile can easily make in one day. The Whitewater, however, is a little more difficult to reach, involving a journey of about 175 miles. Motor stages connect Williams Lake with Big Creek, at which point a road house has been opened. From Big Creek a horse stage will run this summer to the south end of Whitewater or Taseko Lake. The Provincial Government is expected to begin building a road from Hanceville to the Whitewater district this year.

Alberni—S. P. Silverman, president of the Tidewater Copper Co., has gone to the company's Indian Chief mine, for the purpose of resuming work at the mine and mill, which have been shut down since December, 1920. Production, it is expected, will be maintained at about 300 to 350 tons of copper concentrates per month, which will be shipped to the Tacoma smelter. It is planned to increase the capacity of the flotation mill this summer, and to do considerable development work. The mine is dry, requiring no pumping, and the ore is easily broken. Tunnelling, stoping, and open quarrying eliminate the sinking of shafts. The recovery is good. Water power is used. The property of the Tidewater Copper Co. was acquired by its present owners in July, 1916. Previous to this several thousand tons of high-grade ore had been shipped by former owners, the Dewdney Estate and the Tyee Smelting Co. Exploration work by the new owners demonstrated that though there was considerable high-grade ore, the chief production would come from the bodies of low-grade ore which were being developed. Since the mill was closed down much exploration and development work has been done, including 2,500 ft. of diamond drilling.

Ontario

Nipissing Takes Option on Claims in Manitoba—Longyears To Drill West of Hollinger

Cobalt—The Genessee property is being dewatered and underground work will be resumed soon.

The Nipissing has taken an option on the Gordon gold properties at Copper Lake, in northern Manitoba, and will diamond drill them. Work is also proceeding on the Rochester property, in Porcupine.

The New York interests which have taken an option on the Colonial property are arranging to do some work.

Severe snowstorms have practically paralyzed railroad traffic throughout northern Ontario and have seriously interfered with the operations of some of the miners.

Porcupine—The Hollinger is preparing to carry out extensive development below the 850 level. The main shaft will be deepened from 1,250 ft. to 1,550 ft. and levels run at 950, 1,100 1,250, 1,400 and 1,550 ft. This is all practically virgin ground, as last year's report showed only $3,000,000 in ore reserves below the 850 level. It is

understood that in these new workings about fifty faces will be eventually opened. It is also proposed to throw out all the stamps and substitute ball mills, which will give increased capacity without additional space. At the annual meeting next month it is not expected that any increase will be shown in the reserves. There is, however, talk of an increased dividend.

The McIntyre is pushing the new mill additions, which will give a total capacity of 1,000 tons a day when the carbonaceous ores are not being treated.

Work is being rushed on the new power development at Sturgeon Falls. The right of way for the transmission lines is being cut, and an order has been placed for ninety miles of cable for the power lines.

Officials at the Vipond have been notified that it has been decided to dewater the mines in April.

It is understood that the Longyear interests are considering an extensive diamond-drilling campaign on the sand plains west of the Hollinger, which would necessitate an expenditure of $100,000. In this section there are no rock exposures, and the sand overburden is from 100 to 150 ft. deep. It is believed, however, that there is a strong probabilitiy of the Hollinger vein systems extending into this unknown area.

The main shaft at the Dome has reached 1,450 ft. and a station is being cut. Gross production for February will be over $300,000.

Kirkland—The Argonaut shaft will be sunk from 350 to 500 ft., and it has also been decided to diamond drill the property.

During January, the Lake Shore treated 2,335 tons of ore and recovered $51,883, or an average of $22.20 a ton.

Preparations are being made to start work on a number of properties. Work is being resumed on the Canadian Kirkland. Diamond drilling will be started on the Highland Kirkland. A 400-ft. shaft will be sunk on the Elkstone-Dunkin, and the Montreal Kirkland will sink from 100 to 300 ft.

Dip Compass Useful in Locating Non-Magnetic Iron Ore

The usefulness of the dip compass for locating non-magnetic iron ore deposits has been demonstrated, in the opinion of W. R. Crane, the superintendent of the Bureau of Mines Southern Experiment Station at Tuscaloosa, Ala. Further experiments are to be conducted in an effort to improve the interpretation of results, particularly with reference to the character of the deposits.

An advisory committee, which will assist in working out the program of investigations at the same station, has been selected as follows: C. E. Abbott, Tennesse Coal, Iron & Railroad Co.; C. E. Bowron, Gulf States Steel Co.; W. M. Lacey, Woodward Iron Co.; W. J. Penhallegon, Republic Iron & Steel Co.; J. E. Strong, The Alabama Co.; H. J. Thomas, Sloss-Sheffield Steel & Iron Co.

WASHINGTON

Labor Still Plentiful—Premier Shipping More Ore to Tacoma—Labor Plentiful

BY HILLIARD W. POWER

Spokane—With the Star-Hecla-Day-Smith litigation settled, and the Northwest Mining Convention, held in Spokane every February, adjourned, Northwest mining men are for the most part entirely out of conversational material. That is, aside from their own troubles and hopes. With the long and cold winter, which continues lingering upon the lap of spring, and gives promise, according to indications, of continuing to linger, there are at present ample excuses for Northwest mining men to mention trouble. While the cold remains, water will freeze up or get low; fuel run out; employees slip down an icy hill and get hurt, and there are prospects of damage from snowslide looming up, as soon as soft weather comes. However, a general feeling of optimism is prevalent, and expectations are that 1922, as far as mining in the Northwest is concerned, will show a distinct improvement over operations in 1921.

February has been a duplication of January. The same producers and smelters have operated as in January with approximately the same tonnage handled. The Tacoma smelter, however, has begun to receive increased shipments of ore from the Premier mine, Portland Canal, B. C., now that the 11¾-mile aërial tramway has been completed. With more favorable arrangements for custom shippers in effect, the Trail smelter has been receiving a slightly greater tonnage of ore from independents. The Silversmith's high-grade output has been consigned for the most part to the Bunker Hill plant at Kellogg, which has been able to keep two furnaces in operation for several weeks.

Official announcements by the Bunker Hill & Sullivan of a definite intention to install an electrolytic plant at Kellogg make it appear likely that construction upon this scheme will be well under way by midsummer. Actual preparation for building has hinged in a large measure upon the outcome of the Star-Federal and Day-Smith-Hecla litigation.

There is more inquiry for Northwest mining stocks from the East than at any time in the last two years. This upward tendency locally is regarded as a barometer of improvement, as the Spokane Stock Exchange quotations began slumping heavily long prior to the big reduction in operations and output which took place in the district over a year ago.

Labor continues plentiful, although there has been a considerable exodus of miners and other mine workers to Butte, more particularly from the Cœur d'Alenes, following announcement of Anaconda's plans for resumption of operations.

MONTANA

Anaconda Employing 5,500 Men at Butte; Hoisting 5,000 to 6,000 Tons of Ore

BY A. B. KEITH

Butte—Anaconda will soon be producing copper and zinc shingles at a daily rate sufficient to roof twenty ordinary dwellings, according to an announcement made by Frederick Laist. New machines, designed especially by the company's engineers for turning out this product, have been installed at the Raritan plant, in New Jersey. These have a capacity of 40,000 units every twenty-four hours. It was Mr. Laist's belief that his company would be ready to make shipments of the shingle practically at once. Merchandising plans of the Anaconda company now call for a package of shingles weighing 40 lb., instead of 100, as it was found to be too difficult to carry a bundle of 100 lb. up a ladder to a roof, whereas 40 lb. was found to be a convenient weight.

Anaconda now has seven properties at work in the Butte district, employing 5,500 men, and is increasing this force as experienced men present themselves. Applications for employment at the time of resumption brought an average of 100 workmen daily, which number has now dwindled to about sixty, with the number of experienced miners small.

The daily tonnage is ranging from 5,000 to 6,000, and this will be increased steadily, under the present plans for expansion. The electrolytic department of the Great Falls copper refinery of the company has resumed operations, and it is expected to have the furnace at this plant working soon. The schedule called for the employment of 1,000 men at the Great Falls works by March 1, to be built up to 1,200 this summer, as compared with a normal maximum of 1,500. The force at the Washoe smelters at Anaconda will be kept at 2,000 for some months as against a normal of 3,000 before the shutdown.

The Anaconda company shipped last week from its Great Falls rod and wire plant six carloads of copper wire to Valparaiso, Chile, for use in connection with the electrification of the Chilean National Railways, the shipment weighing more than 2,000,000 lb. The company has received many inquiries for copper wire.

The Greene-Cananea company, of whose stock the Anaconda is an important owner, will be called upon to help out in the matter of supplying American Brass Co. with its metal needs, and its capacity, of both mill and smelter, will, it is reported, be increased 500 tons daily.

In a report made by Prof. James F. Kemp, of Columbia University, the following interesting observations are made in connection with Anaconda Copper Mining Co.: The ore mined averages 3.30 per cent copper, of which an average recovery of 96 per cent is had through oil flotation, with a net recovery after smelting and refining of

91.50 per cent of all values in the crude ore. Dr. Kemp states that the company has opened 2,200 miles of workings and in normal years operates twenty-three different mines or shafts. Ore reserves indicated are of sufficient tonnage to support operations on a normal scale for fifteen to sixteen years to come. This number of years in no way covers the life of the Butte mines, as it is uneconomical to develop ore far ahead in deep mining properties. In its South American properties the Anaconda has the following ore reserves:

Property	Tonnage	Copper, Per Cent
Andes	128,000,000	1.49
Cerro Verde	20,000,000	1.92
Lo Aguirre ...	8,000,000	1.98
Africana	2,000,000	3.50

Improvement observable in the shaft vein of the Tuolumne Copper Co. as depth is attained is attracting more attention to the possibilities attendant upon deep development in the east side. Increasing confidence is indicated in the zone of mineralization, which is looked for when the Main Range shaft has reached its objective, which is the 2,600 level.

The Davis-Daly interests have been negotiating with the W. A. Clark officials to handle the second-class ore of the Davis-Daly at the Timber Butte mill, the concentrates to be shipped to the Washoe smelter of Anaconda for treatment.

The East Butte Mining Co. has under construction with the C. V. Nordberg Machinery Co., of Butte and Missoula, an electrical hoist to cost about $35,000, good for about 3,500 ft. in depth. This will be installed at the new shaft recently raised through to the surface. Early delivery of the hoist is anticipated.

Formation of a new company with a capital of $2,500,000 in shares of $10 to operate the old Butte-Bullwhacker and the Butte-Duluth in consolidated form is proposed by a number of Butte business men, in a formal statement to stockholders and bondholders of both companies, outlining an exchange basis. Both properites were operated during pre-war years on a scheme for leaching copper ore with sulphuric acid and precipitating the copper electrolytically. The process was not a commercial success.

Spokane Oil Boom Collapses

A feature of the month of February was an almost total collapse of an incipient "oil boom," which started in Spokane last fall, and continued throughout the winter, and which was due largely to the discovery of an alleged "seepage" a year ago inside the city limits. The Geological Survey investigations put a damper upon the whole affair. Notwithstanding this fact, drilling is being continued by two or three concerns, which incorporated and sold a considerable volume of stock to local investors. No discovery of petroleum has been made.

OREGON

Medford-Jacksonville Railway Purchased by Owner of Opp Mine—Stamp Mill To Be Enlarged

Jacksonville — J. W. Opp, owner of the Opp mine, one and one-half miles west of Jacksonville, has purchased the Medford-Jacksonville electric and steam railway extending between these two points and three miles beyond Jacksonville past the Opp mine. This transaction is expected to result in new activity in the district west of Jacksonville, and to meet the resulting conditions the Opp mine will enlarge its stamp mill to handle the output of the smaller mines by building feeders to them. A cement, brick, and tile plant is also planned for establishment at the Opp for the utilization of ore tailings. Extension of the road west of the present terminus would tap a rich timber and mining belt, long undeveloped.

The Opp mine was discovered many years ago, but its chief development has taken place within the last sixteen years. Its holdings aggregate 373 acres. It is opened by eighteen adits, disclosing three main veins. The longest crosscut entry is 850 ft.; another is 550 ft. long. The total underground workings amount to about 7,000 ft.

Hecla Company Strikes Rich Ore in Tiger-Poorman Group

When the Hecla Mining Co. took over the old Tiger-Poorman group of claims in settlement of pending apex litigation with the Federal Mining & Smelting Co., it added an asset to its holdings more valuable than had been surmised. Evidence of this came to light a few weeks ago, when a remarkably fine shoot of lead-silver ore, carbonate and sulphide, was discovered on the Wide West claim. It is about 2 ft. wide at a depth from the surface of about 150 ft., all shipping grade, and ten or twelve tons are being sacked a day, taken out in extending the drift.

Bunker Hill's New Zinc Plant To Be Started Soon

The decision in the Star case in favor of the Hecla Mining Co. and the Bunker Hill & Sullivan Mining & Concentrating Co., which insures the joint ownership and operation of the Star mine, settles beyond question that the Bunker Hill & Sullivan company will begin the erection of an electrolytic zinc plant at Kellogg, Idaho, soon. Announcement to this effect was made by F. W. Bradley, of San Francisco, president of the company, immediately following the victory in the courts. The initial plant will probably have a capacity of twenty-five or fifty tons of refined zinc per day, and will be completed by the time the Star mine is ready for production, which, it is estimated, will be within two years. Additional units will be added, with the view to eventually providing a local market for the entire zinc product of the Cœur d'Alenes.

CALIFORNIA

Engels Copper Mining Co. Has New President—New Organization Plans To Erect Smelter

San Francisco Correspondence

San Francisco—The stockholders of the Silver Hills Nevada Mines Co. are to be offered the opportunity for transferring their shares in a new corporation to be known as the Silver Hills Comstock. The new corporation is to take over the Buckeye Consolidated mine, in the Comstock district, Virginia City. This property had been abandoned, but appears to offer some opportunities under present-day conditions. The offer, it is understood, is tentative, and final announcements have yet to be made by W. J. Loring.

It is also currently reported that the option held upon the property of the Melones Mining Co. will be exercised by the Carson Hill Gold Mining Co. The cyanide plant and mine have been used for some time by the Carson Hill company in working and developing the latter's Morgan claim.

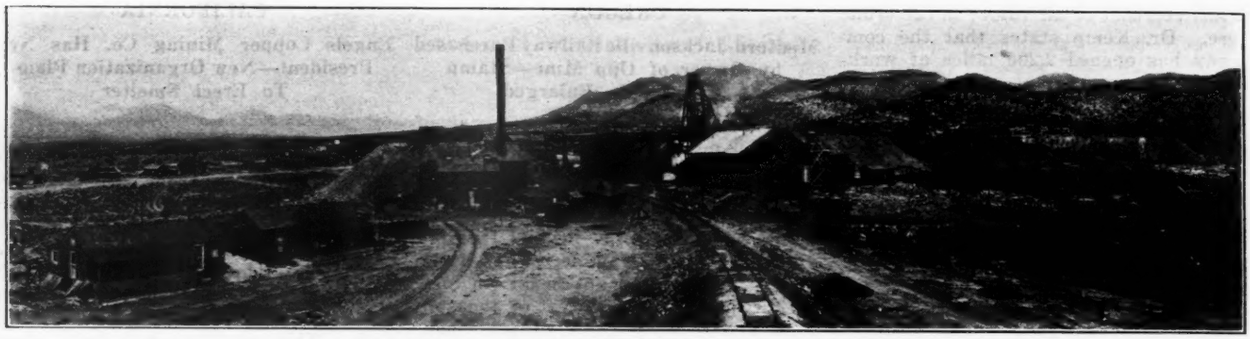
At a recent meeting of the directors of the Engels Copper Mining Co. the following officers were elected: F. Klamp, president, succeeding Henry Engels; J. F. Humburg, vice-president; E. E. Paxton, manager, and R. A. Kinzie, operating engineer. The existing policies are to be continued.

Preliminary announcement of price reductions for high explosives and black blasting powder have been made by one explosives company, effective Feb. 17, 1922.

Local reports state that the Jo Rand Smelting Co., a new company incorporated in California, intends to erect a smelter at Mojave, Cal. R. L. Gilmore, of Bakersfield, is stated to be secretary and treasurer.

Northern California — At French Gulch (Shasta County), the Gladstone mine is reported to have reached a condition where a small initial production can be made. The property employs twenty-two men and has a thirty-stamp mill. Development work has begun at the Lone Pine mine, a small property in Squaw Gulch near Cecilville. Prospecting for channel leads is also under way at the junction of the East and South forks of the Salmon River. The new wire-rope tramway of the Mountain Copper Co., Ltd., connecting with Mathewson, is being tried out, and in a short time will be in operation.

Mother Lode Region—According to Stanley Arnot, about 750 miners are at work in Amador County. The Shenandoah mine, a mile north of the Plymouth, is being unwatered. The Moore mine, near Jackson, has been unwatered, and development is being carried out, but just what the mine will do in the future is uncertain. In the Fremont, old workings in the vicinity of the North Gover orebody have been reclaimed, with the exception of the drift in the ore which was found caved. Production at the mine is still in the future.



PLANT OF PRINCE CONSOLIDATED MINING CO., AT PIOCHE, NEV.

NEVADA

Snowslides Hold Up Operations in Tonopah District — Tonopah Belmont Cuts Charges on Custom Ore

From Our Special Correspondent

Tonopah—Operations are normal in this district. All work in this and adjoining districts was suspended for twenty-four hours on Feb. 11 and 12, owing to lack of electric power. Snowslides on the White Mountains temporarily obliterated the power line which supplies southern Nevada, and no power was available for a period of twenty-two hours. No extensive damage resulted, according to reports that have been received.

The Tonopah Belmont Development Co., which operates a 500-ton plant on its own and custom ore, has announced a new and reduced scale of treatment charges on custom ore. Reductions vary from 75c. to 50c. per ton, the greatest reduction being based on ore valued up to $20 per ton. This reduction will undoubtedly stimulate the mining of low-grade blocks by leasers in the Montana, Midway, MacNamara, and Jim Butler mines.

Hornsilver—In the Orleans Hornsilver mine work has been resumed in the southeast drift on the 7th level in ore. The winze from this level continues in ore, the last 15 ft. being said to show 6 ft. of ore of excellent grade. Official reports are to the effect that the company is now negotiating the sale of a block of treasury stock to finance mill construction.

Royston—Weather conditions have moderated, and surface lease work has been resumed in this district. Another shipment is being prepared from the Betts lease. The grade is reported to be lower than the last shipment, which ran $311 per ton, but is good shipping ore. The orebody was faulted in the Betts shaft and has not yet been located west of the fault. Contractors are at work sinking the incline shaft, already 300 ft. deep, of the Hudson Company.

Virginia City — The Buckeye Comstock mine, on the Brunswick-Accidental lode and about one mile east of Silver City, has been purchased by the Silver Hills Nevada Mines Co., of which W. J. Loring is president. The purchase price is said to be $65,000, most of which is cash. The property is opened to a depth of 650 ft., and is flooded below the 200 level. Past production of the property is reported to have been $1,200,000, mostly in gold.

Ely — Assays from the Bowen-Ely property, which is situated on the East side of Steptoe Valley about nine miles from Ely, demonstrate that the mine will soon be in the shipping class. The principal value in the ore is gold, the vein across a width of 2 ft. carrying 5 oz. in gold, with less than an ounce in silver.

Rumor points to a resumption of activity by the Nevada Consolidated on April 1. However, no increase is noted in the number of men put on. In fact, the recent increase has been offset by a number of men being laid off in the repair departments.

Pioche—The Virginia Louise Mining Co. may be forced into the hands of a receiver owing to the action of certain bond holders who are apparently not in sympathy with the present waiting policy of the management. Substantial ore reserves are reported to be present in this property by Walter Harvey Weed, who recently examined the mine. Litigation with the neighboring Prince mine caused the bonding of the property in its early stages of development, but though the company's mining operations have been conducted at a profit, it has been found impossible to retire the bonds.

Resumption of operations is expected at three of the mines in the Silverhorn district, which enjoyed a brief but lively boom just a year ago. The properties expected to resume are the Silver Horn, the Silver Dale, and the Silver Peer. Stock manipulation and lack of underground development were the principal causes of the cessation of operations on July 1 of last year.

Ore shipments from the Pioche district for the week ended Feb. 17 were curtailed on account of serious washouts on the Pioche Branch of the Union Pacific system, six days elapsing before a train was able to make the trip. The following shipments were sent forward to the Salt Lake Valley smelters: Black Metals mine, 285 tons; Bristol Silver Mines, 110; DeWitt Cunnington Lease, 40; Clark Lease, 35; a total of 470 tons for the district. The ore bins at the Bristol and Jackrabbit are full of ore. Two leasers at the latter shipped ore of higher grade.

UTAH

New Mill of Silver King Coalition Operating—Eight Valley Furnaces Running

From Our Special Correspondent

Park City—Shipments for the week ended Feb. 18 amounted to 2,662 tons, compared with 2,354 tons the week before. Shippers were: Judge allied companies, 1,532 tons; Silver King Coalition, 1,661; and Ontario, 479.

The Judge Mining & Smelting Co. places its net return or net earnings for 1921 at $19,926 in its annual report to the State Board of Equalization. Production was 17,259 tons of ore, which gave a gross return of $582,606. The company lists the value of its property, improvements, and machinery at $299,080, and the total value for assessment purposes at $358,860.

The Daly Mining Co. in 1921 mined 903 tons of ore, from which there was received a gross return of $37,752. The expenses of extraction amounted to $9,415 more than this figure. The valuation of the mine for assessment is placed at $11,336, all of which is represented in machinery.

The Daly West Mining Co. reports 7,510 tons of ore mined during 1921, from which gross returns of $233,019 were received. The assessed valuation is $46,340.

The new mill of the Silver King Coalition is practically completed, and some of the machinery is being tried out. Regular operation has begun. The new mill will have a capacity of 450 tons a day and was built to replace the old plant destroyed by fire on Jan. 27, 1921. Active construction was begun July 1. Production has been held down the last few months, and only enough first-class ore shipped to enable the company to get along. Much second-class or milling ore has been developed, and when it has been necessary to break this it has been stored in stopes and drifts. Much development has been done in the last two years, and numerous new orebodies have been opened. As soon as milling is started the output will be largely increased, as it will be possible to ship more first-class ore in addition to the material milled. The property is stated to be in better condition on account of extensive development than it has been in the last seven or eight years.

Salt Lake City—The road to the Alta Tunnel & Transportation Co.'s property in Big Cottonwood has been reopened for the first time since the blizzard early in February, and ore has been hauled to the stockpile in the main canyon, and to the smelter at Murray, by reloading. This is the eighteenth lot shipped. Development has been in progress since shipping ceased, and the opening of the main stope has continued. A raise here has followed ore, and the presence of other ore beds overlying the first bed is expected to be disclosed.

Furnaces in operation at the Salt Lake Valley smelters during February were as follows: The U. S. Smelting, Refining & Mining Co. at Midvale ran three lead furnaces, including one furnace on matte concentration. The A. S. & R. at Murray ran two lead furnaces. The Garfield smelter of the A. S. & R. had two reverberatories and one blast furnace in operation, treating siliceous silver ores chiefly. The matte, which went through the hearth of one of the reverberatories, and of which there has been a gradual accumulation for some time, amounting to between 4,000 and 5,000 tons, is being mined out and reworked in the other furnaces. This material, besides the copper, carries about 300 oz. silver and up to 5 oz. in gold per ton. There is some talk of the International smelter at Tooele resuming.

The Cardiff Mining & Milling Co. places a valuation of $93,183 on its property in the annual report made to the State Board of Equalization. In all, 6,023 tons of ore was produced, yielding $122,720 gross and $14,609 net profit.

Eureka—Ore shipments from the Tintic district for the week ended Feb. 18 amounted to 148 cars, as compared with 136 cars the week before. Increased shipments were made by the Chief Consolidated, Grand Central, and Tintic Standard, and shipments from the Eagle & Blue Bell and Victoria decreased on account of labor trouble. Shippers were: Tintic Standard, 59 cars; Chief Consolidated, 51; Grand Central, 11; Swansea, 5; Iron Blossom, 6; Centennial Eureka, 4; Dragon, 3; Eagle & Blue Bell, 2; Gemini, 2; Bullion Beck, 2; Tintic Milling, 1; Empire Mines, 1; and Victoria, 1.

Bisbee and Douglas to Educate Tourists

The mines at Bisbee and the smelters at Douglas, Ariz., are to be capitalized for sightseeing by the Chambers of Commerce of the two cities, working together. It is proposed to pluck the traveler from the trains, on granted stop-overs, and to halt the speeding auto tourists, to extend them guidance and hospitality and thus to educate the American public in detail regarding the wonders and riches of the copper producing section visited.

ARIZONA

Conditions Improved Owing to Resumption by Copper Companies

BY JAMES H. MCCLINTOCK

Phoenix—Generally, the mining industry of Arizona has taken on a much healthier tone during February, with the starting of a number of copper-reduction plants and consequent employment of many men in mining and transportation work. Arizona Commercial is the last to start work in the Globe section, though ore will not be produced till the Old Dominion mill will receive it. Miami is running with a closer approach to normal than any other Southwestern copper camp. At Bisbee the principal companies are adding men, and at Douglas they are smelting ores that have been in stock for a long time.

Official advices from Mexico are to the effect that the Cananea Consolidated Copper Co., at Cananea, and the Moctezuma Copper Co., at Nacozari and Pilares, are preparing to resume operations. The Moctezuma is a Phelps Dodge subsidiary. Magma, at Superior, with a remarkable ore showing at 2,000-ft. depth, may delay increased operations until its own smelter has been built and its private railroad widened. United Verde has awarded a $150,000 contract for the foundations of its new $1,500,000 crushing plant, to be built near Clarkdale.

Among the smaller mines, work has been resumed at the famous Fortuna gold mine, near Yuma; a twenty-five-ton concentrator is operating on the Sunshine-Sunrise property, near Tucson, on gold-silver-lead ore; the Mildred gold mill, near Congress, has been started; Verde Inspiration, near Jerome, is installing a cyanide milling plant; the well-known Little Butte copper property, near Bouse, has passed into the hands of a southern California corporation formed for the purchase; and a fifty-ton silver mill is to be placed on the Stargo property, near Morenci, which is financed by Morris Kullman, of New York.

The Phelps Dodge Corporation has deposited $100,000 in the United States Court at Tucson, Ariz., and has received receipt for payment for the Rough Rider group of twelve claims in the Warren district of Arizona, adjoining the Copper Queen. The purchase price was $200,000, payable to Hovland & Smith, mining operators whose affairs have been before a master in chancery in Tucson for a year, in the final adjustment of which Hoval A. Smith was adjudged to have about $1,000,000 coming to him on dissolution of the partnership. The master receives a fee of $11,000, ordered by the court.

The Phelps Dodge Corporation has asked relief from all connection with the matter, save in so far as it may have concern in holding 32,585 shares of the stock of the Washington Mines Development Co. as security for advances made Hoval A. Smith and F. O. Bostwick.

Prescott—Ore is being received at Humboldt from the Swansea lease, in northern Yuma County. It is expected that one of the furnaces of the old Consolidated Arizona plant will be started in the event of reorganization by the Southwest Metals Co.

It is understood that the Shea, at Jerome, has been absorbed by Calumet & Arizona interests. Its ores are siliceous, of a kind needed in the C. & A. smelter at Douglas.

All machinery and equipment of the Rigby reduction plant and Great Western smelter at Mayer are being offered for sale, piecemeal. The smelter consists of a 200-ton water-jacketed blast furnace.

Oatman—The San Francisco Mining Co. has closed a contract for a definite diamond-drilling program. This will be done from the surface. The ground lies just to the northeast of the Oatman United. The company is headed by W. K. Ridenour, with J. A. Hassell, F. Van Sayer, and W. B. Phellps as the other officers.

United American and Telluride are ready for ore shipments to the Tom Reed mill. Delay in the arrival of a weighing machine and a few minor changes at the mill have resulted in the date for ore acceptance being set for early in March. The contracts of the two properties mentioned call for a minimum delivery of twenty-five tons per day.

Diamond drilling at the Merry Widow is well under way. The first hole has been started from the surface at an angle and is down 200 ft. It is expected that this will cut the first ledge at a depth of 350 ft. and the second at 800 to 900 ft.

White Hills—F. W. Traphagen, of Golden, Col., has arrived to take charge of metallurgical work at the White Hills mill. Twenty stamps with twelve pan amalgamators are to be started at once. Damage done recently by fire in the hoist house at the Grand Army shaft has been repaired and another hoist mounted. The Occident shaft has been sunk 100 ft. below the lowest old level. Drifts will be driven under the ore shoots so as to get about 75 ft. of new backs.

Would Revise Sampling Methods in Joplin District

Mine and smelter operators in the Joplin district are trying to revise the present plan of sampling, assaying, and settling for ore in this field, believing that a plan can be worked out that will mean a big saving to the district. Committees appointed by the Tri-State branch of the American Zinc Institute and the Tri-State branch of the American Mining Congress have conferred for joint recommendations, submitted to and approved by the operators, at a meeting held at Picher on Feb. 17. The representatives of the smelters will hold a meeting in the immediate future, and it is believed a new plan will be worked out and agreed upon.

MICHIGAN

The Copper Country

Trimountain's Output Continues To Increase—Reduction in Rail Freight Rate on Ore Desirable

BY M. W. YOUNGS

Houghton—Not much metal is moving out of the Lake district, shipments being confined to small lots to domestic buyers. Foreign business is almost negligible. Copper Range has a three months' supply of metal on hand at present rate of production, and Quincy, Mohawk and Wolverine also have good-sized stocks. No large increase in the metal movement is now expected until spring, after the season of navigation has opened.

Calumet & Hecla is nearing the end of its supply of mineral, mass, and cupola blocks at its smelter, and April 1 will see this accumulation exhausted, it is believed. Soon after that date, with mining operations in progress, a new supply will be available. Seven furnaces are in operation at the smelter, and the present net output is in excess of 100,000 lb. daily.

Several of Calumet & Hecla's conglomerate shafts undoubtedly will be ready for resumption of mining operations on or about April 1. The work of cleaning out the shafts, removing trap or vein rock which has accumulated through a crushing of the ground, retimbering and straightening out the skipways is slow, for only a limited number of men can be employed, and several months will be required to put all shafts in readiness.

In Calumet & Hecla's Red Jacket shaft, where three shifts of men are at work, timbering has been completed to the 57th level, and attention is now being paid to the crosscut extending into the tract below Tamarack Junior. This probably will be the only important section of mining ground available until next fall. In No. 2 shaft, extensive repairs will be necessary only for one level, the 17th. The greater part of the ground yet to be removed in this shaft consists of shaft pillars, arches and backs. Though the life of this shaft is limited, an immense amount of rock is still available, and it will be a heavy contributor to production before it is finally abandoned. In No. 4 shaft timbering is also under way. The ground below Tamarack Junior also can be reached from this shaft, and in addition there is still a large amount of ground to be mined in the bottom levels. From Nos. 6 and 7 shafts considerable vein rock is being removed during the course of reopening, and this will be available for milling. The Red Jacket shaft and Nos. 4, 6 and 7 probably will be the shafts to start operations with the resumption of regular mining.

At the Copper Range mines the improvement noted in Trimountain during the last six months continues, and production from this property is steadily increasing. It has reached a total of 14,000 tons a month, the rock averaging 30 lb. to the ton.

The work of putting Seneca's Gratiot No. 2 shaft in condition for resumption of sinking will now proceed rapidly. The concrete shaft collar is practically completed. The task of straightening out the shaft to conform with the dip of the lode has been completed to below the 6th level. Seven more levels are to receive attention. The shaft is to be sunk to a depth of 3,200 ft., at which point it will be connected with the Seneca shaft. The five drifts, north and south, from the Seneca shaft are proceeding in good ground.

The recent reduction in rail freight rates on refined copper shipments has led to the hope that rates on rock (ore) shipments from mine to mill will be reduced. The high cost of rock transportation, more than double the pre-war rates, is a considerable factor in increased mining costs, amounting to from 1 to 2c. for mines not owning their own railroads. Mohawk, Wolverine, and Ahmeek are particularly hard hit by these high rates.

The February production of refined copper in the Lake (Michigan) district was 8,300,000 lb., as compared with 8,650,000 lb. for January. The present rate of output is slightly under 40 per cent of normal for the district. Eleven furnaces were in operation in February, as follows: Calumet & Hecla, seven; Copper Range (Michigan), three; and Quincy, one.

ALABAMA

Iron Output Continues To Increase—Rock Asphalt Deposits Studied—Interest in Gold Mining Possibilities

BY GEORGE HUNTINGTON CLARK

Birmingham—Pig-iron production in Alabama thus far in 1922 is by way of fulfilling recent predictions, with some excess. The January output is now officially stated at 121,067 tons, which is greater than for any month of 1921 except January and February.

The single furnace in blast of the Republic Iron & Steel Co. at Thomas during January broke all its previous records as an iron maker. Other furnaces in the district are also making a larger production. February's output will probably be around the 125,000 ton mark. The blast furnace of the Gulf States Steel Co., at Alabama City, has just been fired, to be followed later by the blowing in of the company's two open-hearth furnaces. The stack just fired will handle 750 or 800 tons daily.

The No. 4 blast furnace of the Tennessee Coal, Iron & R.R. Co. at Ensley, which has been practically rebuilt, and has had its capacity increased to 400 tons per day, is to be blown in about March 1, which may bring the March output above 140,000 tons. Four of the Tennessee company's Ensley furnaces have been in operation for some months, so the addition of another stack will mean an increase in the output of basic iron.

Seven of the nine Ensley open-hearth furnaces were in operation during February.

To summarize, the fourteen stacks now in blast in Alabama, eight of which are in the immediate Birmingham district, represent approximately 56 per cent of the average normal pig-iron production, showing an increase of 180 per cent over July, 1921.

The amount of ore being raised is not precisely ascertainable, as an unknown percentage of it is drawn from reserve furnace stocks. If mined for February melt, it would amount to about 330,000 tons on a basis of average analysis.

Outside of iron making, mining operations in Alabama have generally shown a limited reaction from the post-war depression, but greater confidence seems manifested.

Much attention is being given to deposits of rock asphalt, suitable for road building purposes, which occur in a wholly undeveloped condition in about eight or nine different counties in the Paleozoic or Valley district of the state. Kentucky has so fully demonstrated the usefulness of this material on heavy-traffic highways, when it is of good quality and properly laid, that the production of these asphalts and their manufacture may assume definite commercial form in Alabama if prospecting shows that conditions warrant.

Interest is being shown in the gold-mining possibilities of Alabama. At one time there were properties under profitable development, operations being mainly confined, however, to the recovery of free gold by crude methods. The refractory gold ores which occur are being studied by experienced miners, who say they plan to erect reduction plants if a method of treatment can be developed.

COLORADO

New Dredging Company Organized

Rollinsville—The Pactolus Dredging Co. has been organized to work placer ground at Rollinsville, Col., forty-two miles west of Denver on the Moffatt road. It has leases on an acreage of between 5,000,000 and 6,000,000 cu.yd. of gravel, 12 to 16 ft. deep. The ground has been tested by drilling and shafts and is said to average a minimum of 50c. per cu.yd. A contract has been let for a 2,000 cu.yd. dredge, to be in operation this May. The above-named company also holds leases on Gamble gulch, above Rollinsville, and below the old Gold Dirt mill, from which, on the Gold Dirt claim in the early days, the surface was washed and coarse gold secured. The gulch also contains tailings from the old mill, worked in the early days.

Lake City—The Golconda company, in Hinsdale County, above Lake City, has raised a cash fund of $50,000 for further development. The property has been operated to some extent the last two years to determine its value and to block out sufficient ores for the erection of a mill.

THE MARKET REPORT

Daily Prices of Metals

Feb.	Copper, N. Y., net refinery* Electrolytic	Tin 99 Per Cent	Tin Straits	Lead N. Y.	Lead St. L.	Zinc St. L.
23	12.625	28 625	29.875	4.70	4.40	4.475
24	12.50@12.625	29.00	29.875	4.70	4.40	4.475@4.50
25	12.50	29.125	30.00	4.70	4.40	4.475@4.50
27	12.35@12.50	29.75	30.375	4.70	4.40	4.50
28	12.50	29 25	29.875	4.70	4.40	4.50
Mar. 1	12.50	28.50	29.50	4.70	4.40	4.50@4.55

*These prices correspond to the following quotations for copper delivered: Feb. 23rd, 12.875c.; 24th, 12.75@12.875c.; 25th, 12.75c.; 27th, 12.60@12.75c.; 28th, 12.75c.; March 1, 12.75c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Feb.	Copper Standard Spot	Copper Standard 3M	Copper Electrolytic	Tin Spot	Tin 3M	Lead Spot	Lead 3M	Zinc Spot	Zinc 3M
23	57⅜	58⅜	63½	142	144	20½	20½	24⅜	24⅞
24	58	58⅝	63½	144	146	20½	20½	24⅜	24¾
25	...	...	...	...	...	...	...	...	...
27	59¾	60¾	63½	147½	149½	20⅝	20⅝	24½	24⅞
28	58¾	59¾	63½	145	146¾	20½	20⅝	24½	25
Mar. 1	58⅞	59⅞	63½	141	143	20⅝	20½	24½	25

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Feb.	Sterling Exchange "Checks"	Silver New York Domestic Origin	Silver New York Foreign Origin	Silver London	Feb.	Sterling Exchange "Checks"	Silver New York Domestic Origin	Silver New York Foreign Origin	Silver London
23	440¾	99⅝	64⅜	33	27	443	99⅝	63¾	32½
24	439	99⅝	63½	32⅝	28	442	99⅝	62¾	32⅛
25	440	99⅝	63½	32⅝	Mar. 1	443¾	99⅝	63⅝	32⅜

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-half cent premium.

Average Metal Prices for February

Copper:	
New York Electrolytic	12.864
London Standard	60.250
London Electrolytic	66.125
Lead:	
New York	4.700
St. Louis	4.396
London	20.681
Silver:	
New York, foreign	65.290
New York, domestic	99.625
London	33.891
Sterling Exchange	435.511
Zinc:	
St. Louis	4.485
London	24 213
Tin:	
99 per cent	29.835
Straits	30.767
London	149.850
Antimony	4.416
Quicksilver	48.295
Platinum	89.545

Metal Markets

New York, March 1, 1922

The market has been quiet, throughout the week, with the principal activity in lead. Copper seems to have been arrested in its decline, and greater interest has been manifested in that metal. Zinc has become appreciably stronger, and tin, as usual, has fluctuated considerably in price.

Copper

The net movement in copper for the week was downward, but a noticeable stiffening on the part of producers, to prevent, as far as they are able, a further descent, is apparent. Several agencies which were freely offering copper on practically every drop on the way down to 12.50c. refuse to go lower for the time being, and as these producers are an important factor in the situation, it may become difficult to pick up lots at lower prices, which presumably is what the consumer is anticipating. The rumor of a sale of over five millions pounds of copper to an electrical manufacturer at a price of 12.50c. delivered did much to unsettle the market earlier in the week. We have been unable to trace any sale of that magnitude and at that price, the lowest price reported netting the producer 12.35c. and being for a considerably smaller lot and partly in forward copper. The general level at which producers are now holding is 12.75c. delivered at which price the metal is freely obtainable; higher quotations have been made, but without securing the business. Consumers have lately been more interested, making bids for tonnages below the market level, but without receiving much encouragement from producers. The large producers have participated in the market, but have not made heavy sales. Export business has picked up a bit.

In the issue of Feb. 25, London standard spot copper should have been quoted £57⅜ and three-month standard copper, £58⅜ for Feb. 22.

Lead

The official contract price of the American Smelting & Refining Co. remains at 4.70c. Lead has been sold by other interests at this general New York level. In fact, business has been unusually brisk for several producers, and not a few large-sized orders were placed in both markets. Corroding lead has been in particular demand in the Middle West at a premium amounting to about one-tenth cent per pound over the prices we quote. Besides the paint business, cable companies, storage-battery and other manufacturers have been filling their requirements. One producer reports sales in carload lots to a number of different consuming classes and hails this as an encouraging sign of reviving and prospective activity. Possibly, producers have been anxious to book lead freely because of the possibility of Mexican lead coming into the United States. However, the prices received for Mexican lead shipped abroad have been too attractive lately to encourage shipments of the metal to this country.

Zinc

The market has recovered slightly from Thursday's low of 4.75c., but sales have not been made in great volume. Producers do not apparently wish to sell at the present level, and the market has been as quiet.

Tin

Some buying took place every day, but generally in small volume, and interested parties have become somewhat apprehensive of the London and Banca situation. Owing to the arrivals of rather heavy shipments of metal, the premium on spot tin has disappeared, and it would not be surprising if there develops, as in the London market, a premium on forward metal.

Straits tin for June delivery was quoted as follows: Feb. 23d, 29.50c.; 24th, 29.50c.; 25th, 29.50c.; 27th, 30.375c.; 28th, 29.875c.; March 1, 29.50c.

Arrivals of tin in long tons: Feb. 21st, 50; 23d, London, 425; 27th, London, 10; Straits, 475; 28th, London, 25.

Gold

Gold in London, Feb. 23d, 93s. 9d.; 24th, 93s. 10d.; 27th, 93s. 7d.; 28th 93s. 6d.; March 1, 93s. 3d.

Foreign Exchange

With the exception of marks, foreign exchange continues the strength shown last week, sterling, francs, and lire generaly moving upward. The recent rise is felt to be partly psychological. On Tuesday, Feb. 28th, francs were 9.16c.; lire, 5.315c. and marks 0.44c. New York funds in Montreal, $2\frac{1}{16}$ per cent premium.

Silver

Continued sales by China have been the feature of the market for the last week, with bear covering the only support to the market. On March 1, however, the Indian bazaars come in as heavy buyers for spot silver, their resumption of buying being due undoubtedly to the definite assurances that the rumored import duty of one-quarter rupee per ounce on silver coming into India will not be imposed. The market closes uncertain, with business in New York at slightly lower level than the parity of the London spot quotation.

Mexican Dollars—Feb. 23d, 49$\frac{3}{8}$; 24th, 48$\frac{3}{4}$; 25th, 48$\frac{3}{4}$; 27th, 49; 28th, 48; March 1st, 48$\frac{3}{4}$.

Other Metals

Quotations cover large wholesale lots unless otherwise specified.

Aluminum—20c. per lb. for 99 per cent grade; 19c. for 98@99 per cent; 18c. for 94@98 per cent. Outside market nominal at 16@17c. for 98@99 per cent virgin grades.

Antimony — Chinese and Japanese brands, 4.35c.; market dull. W.C.C. brand, 5@5$\frac{1}{4}$c. per lb. Cookson's "C" grade, spot, 9c. Chinese needle antimony, lump, nominal at 4c. per lb. Standard powdered needle antimony (200 mesh), nominal at 5.25c. per lb.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, wholesale lots, 6$\frac{1}{2}$@7c.

Arsenic—7@7$\frac{1}{4}$c. per lb.

Bismuth—$1.90@$2 per lb.

Cadmium—$1@$1.10 per lb., in 1,000-lb. lots. Smaller quantities, $1.10@$1.25 per lb.

Cobalt — Metal, $3@$3.25 per lb., black oxide, $2 per lb. in bbls.

Iridium—Nominal, $170@$190 per oz.

[1]**Molybdenum Metal**—In rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Standard market, ingot and shot, 41c.; electrolytic, 44c. Small tonnages, spot, nominal at 32c.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—$70 per troy oz. Nominal. $70, Los Angeles, Cal.

Palladium—Nominal, $55@$60 per oz.

Platinum—$85@$90 per oz.

Quicksilver—$49.50 per 75-lb. flask. San Francisco wires $48. Strong.

[1]**Rhodium**—$100@$115 per troy oz.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $18@$20 per lb.

[1]**Tungsten Metal**—Wire, $35@$60 per kilogram, according to purity and gage.

Metallic Ores

Chrome Ore—Ore analyzing 40@45 per cent Cr_2O_3, crude, $18@$20 per net ton; ground, $25; annalyzing 45@50 per cent Cr_2O_3, $19@$21; ground, $25; f.o.b. Atlantic ports. Quotations are nominal.

Iron Ore—Lake Superior ores, per ton, Lower Lake ports: Old Range bessemer, 55 per cent iron, $6.45; Mesabi bessemer, 55 per cent iron, $6.20; Old Rang non-bessemer, 51$\frac{1}{2}$ per cent iron, $5.70; Mesabi non-bessemer, 51$\frac{1}{2}$ per cent iron, $5.55.

Magnetite Ore—F.o.b. Port Henry N. Y.: Old bed 21 furnace, $4.85; old bed concentrates, 63 per cent, $5.75; Harmony, cobbed, 63 per cent, $5.75; new bed low phosphorus, 65 per cent, $8.50.

Manganese Ore — 22@26c. per unit, seaport; chemical ore, $45@$60 per gross ton, lump. Nominal.

Molydenum Ore—85 per cent MoS_2, 45c. per lb. of contained sulphide, New York. Quotation purely nominal.

Tantalum Ore—Guaranteed minimum 60 per cent tantalic acid, 50c. per lb. in ton lots. Nominal.

[1]**Titanium Ores**—Ilmenite 52 per cent TiO_2, 1$\frac{1}{4}$@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 12c. per lb. for ore, with concessions on large lots or contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $3, f.o.b. Atlantic ports. Chinese, as low as $2. Nominal.

Uranium Ore (Carnotite) —Ore containing 1$\frac{1}{2}$ per cent U_3O_8 and 5 per cent V_2O_5 sells for $1.50 per lb. of U_3O_8 and 75c. per lb. of V_2O_5; ore containing 2 per cent U_3O_8 and 5 per cent V_2O_5 sells for $2.25 and 75c. per lb., respectively; higher U_3O_8 and V_2O_5 content commands proportionately higher prices.

Vanadium Ore—$1 per lb. of V_2O_5 (guaranteed minimum of 18 per cent V_2O_5), New York. Nominal.

Zircon — Zirconium silicate, f.o.b. Pablo, Fla., 4$\frac{1}{2}$@13c. per lb.

[1]**Zirkite**—According to conditions, $70@$90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Feb. 25—Zinc blende, per ton, high, $30.70; basis 60 per cent zinc, premium, $26@$27; Prime Western, $25@$24; fines and slimes, $23. Calamine, basis 40 per cent zinc, $12; average settling prices: Blende, $26.31; all zinc ores, $26.21.

Lead, high, $63.85; basis 80 per cent lead, $60; average settling price, all grades of lead, $62.16 per ton.

Shipments for the week: Blende, 7,700; calamine, 70; lead, 2,161 tons. Value, all ores the week, $311,460.

Heavy buying was initiated late today, with a strong demand for Prime Western zinc ores on $25 basis. The same company bought heavily late last Saturday, the buyer claiming he bought 2,500 tons on $24 basis. Buying has been light all this year, and this movement was anticipated by sellers, who have persistently declined to accept lower offerings.

The extraordinary demand and strong price for lead has induced a growing output of this mineral.

Platteville, Wis., Feb. 25—Blende, basis 60 per cent zinc, no sales. Lead ore, basis 80 per cent lead, $60 per ton. Shipments for the week: Blende, none; lead ore, 41 tons. Shipments for the year: Blende, 1,703; lead ore, 560 tons. Shipped during the week to separating plants, 377 tons blende.

Non-Metallic Minerals

Asbestos — Crude No. 1, $800@$1,000; No. 2, $500@$750; spinning fibers, $200@$300; magnesia and compressed sheet fibers, $100@$175; shingle stock, $70@$120; paper stock, $40@$50; cement stock, $12.50@$17.50; floats, $6@$10, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada. Market weak. No demand.

Barytes—Crude, $6@$8 per ton, f.o.b. mines. Ground white, $23, f.o.b. mills. Off-color grades, $17-$21, f.o.b. Southern mills. Foreign barytes, f.o.b. New York, $7 per ton crude.

Bauxite — American, crushed and dried, $6@$8 per gross ton; pulverized and dried, $12@$14 per gross ton; calcined, $20@$22 per gross ton, all f.o.b. shipping points. Foreign bauxite offered at $6@$8 per metric ton, c.i.f Atlantic ports, depending upon grade.

Borax—Granulated, crystals or powdered, in bags, carloads, 5$\frac{1}{4}$c. per lb.; in bbls. 5$\frac{3}{4}$c.

Chalk—English, extra light, 5c. Domestic light, 4$\frac{1}{2}$c; heavy, 4c. per lb all f.o.b. New York.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

China Clay (Kaolin)—Crude, $6@$8; washed, $8@$9; powdered, $12@$20; bags extra, per net ton, f.o.b. mines, Georgia; powdered clay, $13@$20, f.o.b. Virginia points. Imported lump, $14@$20, f.o.b. American ports; powdered, $35@$45, f.o.b., quoted at New York.

Emery—Turkish emery, 6c. per lb. American, 4c. Inferior grades, 3½c., f.o.b., from New England points.

Feldspar—No. 1 pottery grade, $6.50@$6.85 per long ton; No. 2 pottery, $5.75; No. 1 soap grade, $7.25@$7.50, f.o.b. cars. No. 1 Canadian, $22@$23, f.o.b. mill.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $20@$22.50 per ton, f.o.b. Illinois and Kentucky mines; gravel, $15; lump, $12.50, f.o.b. Lordsburg, N. M. Ground, acid grade, 97 per cent CaF_2, $30, New Mexico.

Fuller's Earth—16 to 30 mesh, $20 per ton; 30 to 60 mesh, $20; 60 to 100 mesh, $17; 100 mesh and over, $15, f.o.b. Pennsylvania points. English, $23@$25, f.o.b. New York.

Graphite—Ceylon lump, first quality, 4½@6½c. per lb.; chip, 3½@5c.; dust, 2@3½c.; No. 1 flake, 5@6c.; amorphous, crude, $15@$40.50 per ton. All f.o.b. New York.

Gypsum — Crushed rock, $3@$4.50 per ton, depending upon shipping point. Ground, $4, f.o.b. shipping point.

Kaolin—See China Clay.

Limestone—Crushed, New York State shipping points, ¾ in. size, $1@$1.75 per net ton; 1½ in., $1@$1.25. Prices for other sizes practically the same. Agricultural limestone, $2.50@$3.75 per net ton, f.o.b. eastern shipping points, depending upon analysis.

Magnesite—Crude, $12@$15 per ton. High-grade caustic calcined, lump form, $30@$40 per ton. Plastic calcined, $45@$50 in bbls., carload lots, f.o.b. California points. Atlantic seaboard, $60.

Dead-Burned — $33 per net ton, Chewelah, Wash.; $58@$64, Chester, Pa. Austrian grade, $28 per ton, f.o.b. Baltimore. (Magnesite brick — See Refractories.)

Mica — India block mica, slightly stained, per lb.; No. 6, 35c.; No. 5, $1.25; No. 4, $2.25; No. 3, $2.90; No. 2, $3.65; No. 1, $5.50. Clear block: No. 6, 50c.; No. 5, $1.75; No. 4, $3.25; No. 3, $5; No. 2, $6.50; No. 1, $8; A1, $6.50@$8.50; extra large, $25; ground, wallpaper grade, $90@$160 per ton (depending upon quantity); ground roofing mica, $25@$70, all f.o.b. New York. Water-ground mica, 100 and 160 mesh, 6½c. per lb., f.o.b. Virginia points.

Monazite—Minimum of 6 per cent thorium oxide, $30 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports, pebble grade: 77 per cent tricalcium phosphate, $9.50 ($10.50 for hard rock; 75 per cent, $7.50; 75@74 per cent, $7; 70 per cent, $4.75; 68 per cent, $4.25; 68@66 per cent, $4.

Pumice Stone—Imported, lump, 3@40c. per lb.; domestic lump, 5c.; ground, 5@6c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaports; furnace size, 13c.; Spanish lump, 13@14c.; domestic fines, f.o.b. mines, Georgia, 11@12c.

Silica—Glass sand, $1.25@$2.25 per ton; sand-blast material, $2.25@$4.50, f.o.b. Indiana and Illinois points. Amorphous or decomposed variety, soft silica, 250 mesh, $14; 350 mesh, $18; 450 mesh, $28 per ton. Ganister, crude, $2.50 per ton, f.o.b. Illinois points. Molding sand, building sand, glass sand, $2.25@$3, f.o.b. Pennsylvania points.

Sulphur—$16@$18 per ton for domestic, f.o.b. Texas and Louisiana mines; $18@$20 for export, f.a.s. New York.

Talc—20 to 200 mesh, $7@$12 per ton, f.o.b. Vermont; $8.25@$13, f.o.b. points in Georgia; 200 mesh, $16@$20, f.o.b. Los Angeles.

Mineral Products

Copper Sulphate — Large crystals, 5.65c.; small crystals, 5.55c. per lb., f.o.b. New York.

Potassium Sulphate — Powder, domestic, $1 per unit, basis 90 per cent, f.o.b. New York.

Sodium Nitrate — $2.45@$2.50 per cwt., ex vessel, Atlantic ports.

Sodium Sulphate—For 95 per cent material, $12.50 per ton, f.o.b. in bulk, Western mines, spot and six months' contract; $17@$20 per ton, New York.

Ferro-Alloys

Ferrotitanium—For 15 to 18 per cent material, $200@$225 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 11½c. per lb. of chromium contained; 4 to 6 per cent carbon, 12c., f.o.b. works.

Ferromanganese—Domestic 78 to 82 per cent, $59@$60, f.o.b. furnace; English and German, $62.50, c.i.f. Atlantic seaport. Spiegeleisen, 16@19 per cent, $30 per gross ton, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorous, and arsenic, $2.25 per lb. of contained metal, f.o.b. works. Imported material, $1.70@$2.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $38@$40; 50 per cent, $54@$55; 75 per cent, $115@$120.

Ferrotungsten—Domestic, 70 to 80 per cent W, 40@45c. per lb. of contained tungsten, f.o.b. works. Foreign, 50c., duty paid, f.o.b. Atlantic ports.

Ferro-uranium—35 to 50 per cent U, $6 per lb. of U contained, f.o.b. works.

Ferrovanadium—$4 per lb. of V contained, according to analyses and quantity.

Metal Products

Copper Sheets—Current New York list price, 20.25c. per lb.; wire, 14@14.25c.

Lead Sheets—Full lead sheets, 7¾c.; cut lead sheets, 8c. in quantity, mill lots.

Nickel Silver—26.75c. per lb. for 18 per cent nickel Grade "A" sheets.

Yellow Metal — Dimension sheets, 17.25c.; sheathing, 16.75c.; rods, ⅝ to 3 in., 14.25c.

Zinc Sheets—$8 per 100 lb. less 8 per cent on carload lots, f.o.b. works.

Refractories

Bauxite Brick—56 per cent alumina, $130 per 1,000; 76 per cent, Suprafrax, $200 per 1,000; f.o.b. works, St. Louis and Pittsburgh.

Chrome Brick—$40@$43 per net ton.

Chrome Cement — 40@45 per cent Cr_2O_3, $30@$32 per net ton, and $31 in sacks, carload lots, f.o.b. eastern shipping points.

Firebrick—First quality, 9-in. shapes, $32@$35 per 1,000, Pennsylvania, Ohio and Kentucky.

Magnesite Brick—9-in. straights, $53 per net ton, f.o.b. works.

Silica Brick—9-in., per 1,000, $30@$35 in carload lots, f.o.b. shipping points.

The Iron Trade

Pittsburgh, Feb. 28, 1922

Railroad buying has increased considerably. James McCrea, vice-president of the Pennsylvania Railroad, announced at a meeting of the Pittsburgh Chamber of Commerce last week that his road is working on plans involving expenditures of $100,000,000 in this district.

Steel buying has increased somewhat. Production of steel ingots is at about 28,000,000 tons a year, and seems to be increasing slightly.

The most active demand in steel is for construction work, particularly in sheet and pipe for garage and dwelling-house construction, with a fair tonnage in fabricated steel construction.

Bars, shapes, and plates are now steady, a reflection of the price, 1.40c., which is extremely low. Black and galvanized sheets are firm at 3c. and 4c. respectively. Concessions for large lots of tin plate, priced regularly at $4.75, are more common, and there is slightly more extensive shading in steel pipe. Nails are unchanged at $2.40 to large buyers.

Pig Iron—Bessemer iron seems to be down 50c. to $19, Valley, as a result of a sale of a few hundred tons. Basic, quoted at $18, Valley. Foundry remains at $18.75 to $19, Valley. Demand is light.

Coke

Connellsville—Furnace, $3.25@$3.50; foundry, $4@$4.25.

[1]Foote Mineral Co., Philadelphia, Pa.

METAL STATISTICS

Monthly Average Prices of Metals

Silver

	New York		London		Sterling Exchange	
	1921	1922	1921	1922	1921	1922
January	65.950	65.450	39.985	35.035	372.650	421.750
February	59.233	65.290	34.745	33.891	385.932	435.511
March	56.023	.....	32.479	.....	389.806	.....
April	59.337	.....	34.250	.....	391.784	.....
May	59.810	.....	34.165	.....	396.580	.....
June	58.510	.....	34.971	.....	377.236	.....
July	60.260	.....	37.481	.....	362.565	.....
August	61.597	.....	38.096	.....	364.505	.....
September	66.160	.....	40.082	.....	371.725	.....
October	70.970	.....	41.442	.....	386.315	.....
November	68.234	.....	38.750	.....	396.315	.....
December	65.760	.....	35.645	.....	414.880	.....
Year	62.654	.....	36.841	.....	384.191	.....

New York quotations cents per ounce troy, 999 fine. London, pence per ounce, sterling silver, 925 fine.

Copper

	New York		London			
	Electrolytic		Standard		Electrolytic	
	1921	1922	1921	1922	1921	1922
January	12.597	13.465	70.964	65.226	79.119	72.321
February	12.556	12.864	70.925	60.250	75.925	66.125
March	11.976	.....	67.565	.....	71.190	.....
April	12.438	.....	69.381	.....	71.786	.....
May	12.742	.....	73.196	.....	74.298	.....
June	12.697	.....	71.852	.....	75.682	.....
July	12.170	.....	71.155	.....	75.286	.....
August	11.634	.....	68.614	.....	72.705	.....
September	11.948	.....	67.977	.....	72.295	.....
October	12.673	.....	67.327	.....	73.476	.....
November	13.035	.....	66.614	.....	74.386	.....
December	13.555	.....	66.706	.....	74.525	.....
Year	12.502	.....	69.356	.....	74.223	.....

New York quotations, cents per lb. London, pounds sterling per long ton.

Lead

	New York		St. Louis		London	
	1921	1922	1921	1922	1921	1922
January	4.821	4.700	4.747	4.388	23.387	23.667
February	4.373	4.700	4.228	4.396	20.650	20.681
March	4.084	.....	4.000	.....	18.911	.....
April	4.356	.....	4.272	.....	21.589	.....
May	4.952	.....	4.784	.....	23.399	.....
June	4.485	.....	4.293	.....	22.563	.....
July	4.410	.....	4.260	.....	23.399	.....
August	4.382	.....	4.217	.....	23.489	.....
September	4.600	.....	4.392	.....	23.148	.....
October	4.690	.....	4.439	.....	23.679	.....
November	4.683	.....	4.356	.....	24.483	.....
December	4.700	.....	4.369	.....	25.322	.....
Year	4.545	.....	4.363	.....	22.752	.....

New York and St. Louis quotations, cents per lb. London, pounds sterling per long ton.

Tin

	New York				London	
	99%		Straits			
	1921	1922	1921	1922	1921	1922
January	31.470	31.480	36.000	32.100	190.464	163.065
February	28.534	29.835	32.142	30.767	166.250	149.850
March	27.296	.....	28.806	.....	156.024	.....
April	28.990	.....	30.404	.....	163.905	.....
May	31.431	.....	32.500	.....	177.411	.....
June	28.514	.....	29.423	.....	167.506	.....
July	26.755	.....	27.655	.....	164.530	.....
August	25.662	.....	26.301	.....	155.318	.....
September	26.280	.....	26.680	.....	156.750	.....
October	27.278	.....	27.655	.....	156.380	.....
November	28.592	.....	28.935	.....	158.898	.....
December	32.106	.....	32.486	.....	169.738	.....
Year	28.576	.....	29.916	.....	165.265	.....

New York quotations, cents per lb. London, pounds sterling per long ton.

Zinc

	St. Louis		London	
	1921	1922	1921	1922
January	5.413	4.691	25.262	26.321
February	4.928	4.485	24.850	24.213
March	4.737	.....	25.077	.....
April	4.747	.....	25.530	.....
May	4.848	.....	26.923	.....
June	4.421	.....	26.750	.....
July	4.239	.....	26.262	.....
August	4.186	.....	25.068	.....
September	4.235	.....	25.256	.....
October	4.605	.....	26.315	.....
November	4.667	.....	25.949	.....
December	4.835	.....	26.900	.....
Year	4.655	.....	25.845	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Antimony, Quicksilver and Platinum

	Antimony (a)		Quicksilver (b)		Platinum (c)	
	New York		New York		New York	
	1921	1922	1921	1922	1921	1922
January	5.258	4.463	48.440	49.960	73.400	97.260
February	5.250	4.416	49.545	48.295	70.227	89.545
March	5.282	.....	46.796	.....	72.463	.....
April	5.137	.....	45.423	.....	73.404	.....
May	5.250	.....	47.000	.....	73.740	.....
June	5.087	.....	46.846	.....	74.942	.....
July	4.735	.....	44.950	.....	70.440	.....
August	4.597	.....	45.028	.....	73.222	.....
September	4.564	.....	42.660	.....	75.960	.....
October	5.085	.....	39.840	.....	81.800	.....
November	4.734	.....	39.804	.....	82.609	.....
December	4.500	.....	49.212	.....	78.192	.....
Year	4.957	.....	45.462	.....	75.033	.....

(a) Antimony quotations in cents per lb. for ordinary brands. (b) Quicksilver in dollars per flask. (c) Platinum in dollars per ounce.

Pig Iron, Pittsburgh

	Bessemer		Basic		No. 2 Foundry	
	1921	1922	1921	1922	1921	1922
January	33.96	21.55	31.96	20.15	33.88	21.34
February	28.96	.....	26.96	.....	30.25	.....
March	28.16	.....	26.46	.....	27.85	.....
April	26.96	.....	24.46	.....	26.77	.....
May	26.21	.....	23.84	.....	25.56	.....
June	24.96	.....	22.66	.....	24.38	.....
July	22.84	.....	20.76	.....	22.36	.....
August	21.96	.....	20.29	.....	21.53	.....
September	21.96	.....	21.21	.....	22.82	.....
October	21.96	.....	20.96	.....	22.96	.....
November	21.96	.....	20.96	.....	22.74	.....
December	21.96	.....	20.65	.....	21.96	.....
Year	25.15	.....	23.43	.....	5.26	.....

In dollars per long ton.

Monthly Crude Copper Production

	1921			1922
	October	November	December	January
Alaska shipments	6,160,847	4,841,506	8,881,013	6,909,383
Anaconda	(a)	(a)	(a)	(a)
Arizona Copper	(a)	(a)	(a)	(a)
Calumet & Arizona	(a)	(a)	(a)	(a)
Calumet & Hecla	(a)	(a)	(a)	(a)
Other Lake Superior	4,250,000	5,500,000	5,500,000	6,000,000
Chino	(a)	(a)	(a)	(a)
Con. Ariz. Smelting	(a)	(a)	(a)	(a)
East Butte	1,000,000	750,000	(a)	(b) 750,000
Inspiration	(a)	(a)	(a)	(a)
Magma	(a)	(a)	(a)	(a)
Miami	5,084,000	4,514,000	5,030,941	5,348,000
Nevada Cons.	(a)	(a)	(a)	(a)
New Cornelia	1,536,725	1,605,936	1,717,183	1,692,909
Old Dominion	(a)	(a)	(a)	(a)
Phelps Dodge	(a)	(a)	(a)	(a)
Ray	(a)	(a)	(a)	(a)
Shattuck Arizona	(a)	(a)	(a)	(a)
United Verde	(a)	(a)	(a)	(a)
United Verde Extension	(a)	(a)	(a)	(a)
Utah Copper	(a)	(a)	(a)	(a)
Others, estimated	5,200,000	11,130,000	8,500,000	11,400,000
Total United States	23,231,572	28,341,442	29,629,137	32,010,292
Imports: Ore and concentrates, matte	8,445,551	7,297,583	14,844,641	.....
Imports of blister, unrefined	23,360,893	10,561,454	14,731,185	.....
Imports of refined	761,125	2,139,144	2,447,925	.....
Grand total	55,799,141	49,339,623	61,652,888	.....
Backus & Johnston	198,000	900,000	822,000	1,118,000
Boleo	1,041,863	976,815	954,765	1,102,080
Cananea	(a)	(a)	(a)	(a)
Cerro de Pasco	5,330,000	5,618,000	5,536,000	4,726,000
Chile	4,000,000	4,000,000	4,000,000	4,000,000
Cons. M. & S. of Canada	156,940	200,000	313,290	97,985
Falcon Mines	550,710	518,600	550,800	582,000
Furukawa	2,541,508	.....	.....	.....
Granby Cons.	2,593,250	2,365,017	2,215,403	1,974,162
Hampden Cloncurry	(a)	(a)	(a)	(z)
Katanga	6,189,435	5,984,370	6,570,900	6,772,600
Mount Morgan	(a)	(a)	(a)	(a)
Mount Lyell	1,220,000	1,068,000	782,000	.....
Phelps Dodge Mexican	(a)	(a)	(a)	(a)
Sumitomo	1,444,316	2,910,964	2,732,392	.....
Wallaroo & Moonta	.....	835,760	954,795	.....

(a) No copper produced during this month. (b) Estimated.

Comparative Annual Copper Production

	1919	1920	1921	1922
January	135,733,511	121,903,744	90,596,597	32,010,292
February	111,649,512	117,540,000	86,682,941	.....
March	102,040,460	120,309,316	91 046,345	.....
April	98,808,998	116,078,871	46,946,523	.....
May	92,652,975	114,964,207	25,310,511	.....
June	95,856,570	116,107,856	24,623,693	.....
July	100,369,247	109,729,610	22,033,739	.....
August	107,994,040	112,460,254	23,248,398	.....
September	108,703,075	104,919,562	23,855,316	.....
October	115,143,143	105,231,571	23,231,572	.....
November	117,289,735	106,700,178	28,341,442	.....
December	102,997,633	95,709,009	29,629,137	.....

COMPANY REPORTS

St. Mary's Mineral Land Co.

A report of operations of St. Mary's Mineral Land Co. for 1921 shows the following receipts and expenditures:

RECEIPTS		
Cash on hand Dec. 31, 1920		$69,154.26
Payments for surface	$3,844.50	
Payments for wood and timber	17,592.81	
Distributions	640.00	
Interest	39,355.96	
Ground rent	5,567.75	
Notes collected	39,905.00	
Accounts collected	895.92	
Deferred payments collected	50,000.00	
Treasury certificates of indebtedness	50,000.00	
Sundry other receipts	20.00	204,821.94
		$273,976.20
EXPENDITURES		
Houghton Copper Co. advances	$2,800.00	
Charter and land taxes	6,711.93	
Salaries and expenses at Portland, Boston and Houghton	27,564.81	
1921 Distribution No. 1	160,000.00	
		197,076.74
Cash on hand Dec. 31, 1921		$76,899.46

For another year the demand for mineral lands has been absent and for timber there was little inquiry. Several small sales were made, and in the latter part of the year one fair-sized sale. Many of the mines of the district were idle for the greater part of the year. The Champion Copper Co. operated throughout the year, but made no distributions either of capital or income. From sales of timber and other similar sources a distribution of $1 per share was paid Dec. 15 to stockholders of record Nov. 15.

Sales during the year were as follows: 1,123.99 acres of wood and timber to yield $34,873; 160 acres of surface only, $2,400; 12.89 acres of surface for railroad right of way. For county road construction, 33.28 acres of surface was donated.

The real property of the company Dec. 31, 1921, consisted of 92,175.89 acres, besides the mineral rights to 14,969.76 additional acres.

United Verde Extension Mining Co.

A report of operations of the United Verde Extension Mining Co. for the year ended Dec. 31, 1921, together with report of the treasurer setting forth the financial condition and results for the fiscal year, states that owing to the condition of the copper market, the smelting plant was shut down on May 1, 1921. Ore smelted during the first four months of the year amounted to 53,643 dry tons, which yielded 12,498,005 lb. copper, 2,328 oz. gold, and 112,864 oz. silver. Copper on hand Dec. 31, 1921, amounted to 6,955,942 lb. Amount of ore developed above the 1,500 level was 1,102,000 tons, averaging 11.75 per cent copper, .023 oz. gold, and 2.22 oz. silver.

Approximately $95,000 was spent on construction during the year, consisting of installation of a fuel-oil system at the smelter, completing the hospital, and the building of several company houses.

The table below shows the average cost per pound of copper produced during the year. Owing to the fact that the smelter was operating only four months of the year, the cost per pound of copper shown is abnormally high, as production was charged with the total expenses for the entire year. The cost stated, therefore, should not be taken as a criterion of the cost to the company of its copper produced during normal years.

	Per Lb.
Mining	$0.0590
Smelting	0.0317
Freight on ore	0.0022
Freight on bullion, refining and selling	0.0355
Other expenses	0.0062
	$0.1346

The costs do not include depreciation, reserve to return capital (depletion), or taxes.

General conditions for future operations are slightly improved since the shutdown and wages somewhat reduced, but the reduction of freight rates is essentially necessary to future successful operations at the present price of copper, as is likewise a reduction in the present high taxes. The state and county taxes paid during 1921 amounted to $566,553.04, and if production had continued during the year at the rate of 3,000,000 lb. a month, taxes would have amounted to 1.574c. per lb. of copper. On the actual production, these taxes amounted to 4.533c. per lb. of copper.

STATEMENT OF EARNINGS FOR 1921

Gross revenue from metals and ore produced		$2,043,519.10
Other revenue		275,740.37
		$2,319,259.47
Deductions		
Mine and smelter operating, freight and selling expenses	$1,603,838.27	
Other expenses, including taxes paid, and accrued	678,424.47	2,282,262.74
Earnings from operations		$36,996.73
Less		
Amounts written off to reserves for depletion and depreciation		1,565,538.13
Net loss to surplus		$1,528,541.40

BALANCE SHEET, DEC. 31, 1921

ASSETS		
Mining property, including appraised value of developed orebodies		$40,615,717.16
Less depletion reserve		13,778,874.09
		$26,836,843.07
Smelter plant, mine and other machinery, equipment and buildings	$5,875,369.01	
Less depreciation reserve	2,275,122.36	3,600,246.65
Investments, at cost		2,088,116.35
Land, ranches		269,768.42
Accounts and notes receivable, including interest acrued		1,432,665.04
Inventories of materials and supplies		376,359.91
Cash in banks and on hand		846,146.37
Liberty bonds, at par (Market value Dec. 31, 1921—$3,253,646.58)		3,365,100.00
Due on metals sold, ore and bullion on hand		1,882,283.65
		$40,697,529.46
LIABILITIES		
Capital stock, authorized		$750,000.00
Less treasury stock		225,000.00
		$525,000.00
Accounts payable, including taxes and other accrued charges		1,247,541.93
Reserve for liability insurance		93,670.20
Surplus from appraisal of developed orebodies	$40,000,000.00	
Less amount refunded in 1918 to the stockholders out of reserve fund for depletion	1,575,000.00	38,425,000.00
Surplus account, balance as at Jan. 1, 1921	$2,984,858.73	
Less dividends paid, Nos. 19, 20, 21	1,050,000.00	
	$1,934,858.73	
Deduct net loss for 1921	1,528,541.40	406,317.33
		$40,697,529.46

Mining Dividends for February, 1922

The following dividends were paid by mining companies during February, 1922:

Companies in the United States:	Situation	Per Share	Totals
Chief Consolidated, s. l.	Utah	$0.05 Q	$44,201
Colorado Fuel & Iron, pfd.	Col., N. M., Wyo.	2.00 Q	40,000
Homestake Mining, g.	S. D.	0.25M	62,790
International Nickel, pfd.	N. J., Ont.	1.50 Q	133,689
Miami Copper	Ariz.	0.50 Q	373,557
Mohawk Mining, c.	Mich.	1.00	100,000
New Cornelia, c.	Ariz.	0.25	450,000
New Jersey Zinc	N. J.	2.00 Q	840,000
United Verde Ext., c.	Ariz.	0.25 Q	262,500
Companies in Canada and Mexico:			
Amparo Mining, g. s.	Mex.	0.03 Q	60,000
Hollinger Consol. Gold	Ont.	0.05 4wks.	246,000

The Mohawk Mining Co. resumed the $1 distribution which was last paid in November, 1920; and the new Cornelia Copper Co. again paid 25c., for the first time since Aug. 23, 1920. A resumption of dividends by these two copper companies is a result of lower costs and the gradually improving condition of the copper industry. International nickel continues its preferred dividend and is likely to do so in the future, though producing operations have been suspended.

MINING STOCKS

Week Ended February 25, 1922

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Ahmeek	Boston	62	61	61	Sept. '20, Q	$0.50
Alaska-Br. Col. new.	N. Y. Curb	2⅛	2¼	2⅛	.....	....
Alloues	Boston	26	24	25	Mar. '19	1.00
Anaconda	New York	48⅜	47⅞	48	Nov. '20, Q	1.00
Arcadian Consol.	Boston	2⅜	2⅜	2⅜	.....	....
Ariz. Com'l	Boston	8½	8¼	8½	Oct. '18, Q	0.50
Big Ledge	N. Y. Curb	*25	*22	*22	.....	....
Bingham Mines	Boston	...	...	14	Sept. '19, Q	0.25
Calumet & Arizona	Boston	59½	57¾	57⅞	Dec. '21, Q	0.50
Calumet & Hecla	Boston	280	277	277	June '20, Q	5.00
Canada Copper	N. Y. Curb	*26	*23	*23	.....	....
Centennial	Boston	11	11	11	Dec. '18, SA	1.00
Cerro de Pasco	New York	34	33	33	Mar. '21, Q	0.50
Chile Copper	New York	17	16½	16¼	.....	....
Chino	New York	26	25½	25⅝	Sept. '20, Q	0.37½
Columbus Rexall	Salt Lake	*30	*29⅜	*30	.....	....
Con. Arizona	N. Y. Curb	...	...	*2	Dec. '18, Q	0.05
Con. Copper Mines	N. Y. Curb	1 1/16	1⅛	1⅛	.....	....
Copper Range	Boston	42	40	40	Sept. '20, Q	0.50
Crystal Copper	Boston Curb	*58	*56	*57	.....	....
Davis-Daly	Boston	7⅛	7	7⅛	Mar. '20, Q	0.25
East Butte	Boston	10⅜	10⅛	10⅛	Dec. '19, A	0.50
First National	Boston Curb	*65	*55	*58	Feb. '19, SA	0.15
Franklin	Boston	...	...	1⅛	.....	...
Gadsden Copper	Boston Curb	*50	*50	*50	.....	....
Granby Consol	New York	...	...	28½	May '19, Q	1.25
Greene-Cananea	New York	26⅜	26⅛	26⅛	Nov. '20, Q	0.50
Hancock	Boston	3	3	3	.....	....
Howe Sound	N. Y. Curb	2⅛	2⅛	2⅛	Jan. '21, Q	0.05
Inspiration Consol	New York	38⅛	37⅜	38⅛	Oct. '20, Q	1.00
Iron Cap	Boston Curb	*8	*7½	*7½	Sept. '20, K	0.25
Isle Royale	Boston	23	22	23	Sept. '19, SA	0.50
Kennecott	New York	27⅜	27	27⅛	Dec. '20, Q	0.50
Keweenaw	Boston	1	1	1	.....	....
Lake Copper	Boston	2½	2⅜	2⅜	.....	....
La Salle	Boston	...	...	2	.....	....
Magma Copper	N. Y. Curb	30⅛	28⅛	28⅜	Jan. '19, Q	0.50
Majestic	Boston Curb	†*6	†*5	*3	.....	....
Mason Valley	Boston	1⅜	1⅛	1⅜	.....	....
Mass Consolidated	Boston	2⅛	2½	2⅛	Nov. '17, Q	1.00
Miami Copper	New York	26⅜	26⅛	26⅜	Feb. '22 Q	0.50
Michigan	Boston	2	1⅞	2	.....	....
Mohawk	Boston	56½	55⅜	55½	Feb. '22, Q	1.00
Mother Lode Coa	N. Y. Curb	7⅛	7	7⅛	.....	....
Nevada Consol	New York	13⅞	13½	13½	Sept. '20, Q	0.25
New Cornelia	Boston	18⅛	17	17½	Feb. '22, K	0.25
North Butte	Boston	11⅞	11	11⅛	Oct. '18, Q	0.25
North Lake	Boston	....	....	*25	.....	....
Ohio Copper	N. Y. Curb	*10	*10	*10	.....	....
Old Dominion	Boston	23	23	23	Dec. '18, Q	1.00
Osceola	Boston	32	32	32	June '20, Q	0.50
Phelps Dodge	Open Mar.	†190	†175	...	Jan. '22, Q	1.00
Quincy	Boston	43½	42	42½	Mar. '20, Q	1.00
Ray Consolidated	New York	14	13⅜	13⅜	Dec. '20, Q	0.25
Ray Hercules	N. Y. Curb	*6	*2	*4	.....	....
St. Mary's Min. Ld.	Boston	44⅛	43¾	43⅜	Dec. '21, K	1.00
Seneca Copper	Boston	12⅛	11	12⅛	.....	...
Shannon	Boston	1.00	*90	*90	Nov. '17, Q	0.25
Shattuck Arizona	New York	8⅛	7⅛	7⅛	Jan. '20, Q	0.25
South Lake	Boston	...	...	*65	.....	....
Superior & Boston	Boston	1⅛	1	1⅛	.....	....
Tenn. C. & C. cfs	New York	10⅛	10	10⅛	May '18, I	1.00
Tuolumne	Boston	*55	*55	*55	May '13,	0.10
United Verde Ex	Boston Curb	28⅛	27	28⅛	Feb. '22, Q	0.25
Utah Consol	Boston	1	1	1	Sept. '18,	0.25
Utah Copper	New York	62⅛	61⅛	61⅛	Dec. '21, Q	0.50
Utah Metal & T	Boston	1⅛	1	1 1/16	Dec. '17,	0.30
Victoria	Boston	2⅛	2⅛	2⅛	.....	....
Winona	Boston	*40	*40	*40	.....	....
Wolverine	Boston	10⅛	10⅛	10⅛	.....	....
NICKEL-COPPER						
Internat. Nickel	New York	12⅛	11⅛	12	Mar. '19,	0.50
Internat. Nickel, pfd	New York	67⅛	62	67⅜	Feb. '22, Q	1.50
LEAD						
National Lead	New York	90⅜	89	89	Dec. '21, Q	1.50
National Lead, pfd	New York	113¼	111	113¼	Dec. '21, Q	1.75
St. Joseph Lead	New York	13¾	13⅛	13⅜	Dec. '21, Q	0.25
QUICKSILVER						
New Idria	Boston	*50	*50	*50	.....	....
ZINC						
Am. Z. L. & S	New York	13⅞	13	13	May '20,	1.00
Am. Z. L. & S. pfd	New York	...	...	36⅜	Nov. '20, Q	1.50
Butte C. & Z	New York	5⅜	5⅛	5⅜	June '18,	0.50
Butte & Superior	New York	...	...	26	Sept. '20,	1.25
Callahan Zn-Ld	New York	5⅜	5⅛	5⅛	Dec. '20, Q	0.50
New Jersey Zn	N. Y. Curb	137	135	137	Feb. '22, Q	2.00
Yellow Pine	Los Angeles	...	...	*50	Sept. '20, Q	0.03

*Cents per share. †Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra.

Toronto quotations courtesy Hamilton B. Wills; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange; Los Angeles, Chamber of Commerce and Oil; Colorado Springs, The Financial Press, N. Y.

Stock	Exch.	High	Low	Last		Last Div.
GOLD						
Alaska Gold	New York	⅛	⅛	⅛	.....	....
Alaska Juneau	New York	⅛	⅛	⅛	.....	....
Carson Hill	New York	15⅛	14⅛	14⅛	.....	....
Cresson Consol. G	N. Y. Curb	2 1/16	2⅛	2 1/16	Jan. '22, Q	$0.10
Dome Extension	Toronto	1.00	*84	1.00	.....	....
Dome Mines	New York	25	23⅜	24⅛	Jan. '22, Q	0.25
Florence Goldfield	N. Y. Curb	*28	*25	*27	.....	....
Golden Cycle	Colo. Springs	*77	*75	*75	June '21, Q	0.02
Goldfield Consol	N. Y. Curb	*4	*4	*4	Dec. '19,	0.05
Hollinger Consol	Toronto	9.50	8.95	9.15	Feb. '22,	0.05
Homestake Mining	New York	61⅜	60	61¼	Feb '22, M	0.25
Kirkland Lake	Toronto	*47½	*38½	*46	.....	....
Lake Shore	Toronto	1.95	1.73	1.73	Nov. '21, K	0.02
McIntyre-Porcupine	Toronto	2.87	2.84	2.00	Jan. '22, K	0.05
Porcupine Crown	Toronto	*27	*25	*27	July '17,	0.03
Porcupine V. N. T	Toronto	*28½	*25	*28½	.....	....
Portland	Colo. Springs	*39	*36	*36	Oct. '20, Q	0.01
Schumacher	Toronto	*48	*37	*47½	.....	....
Silver Pick	N. Y. Curb	...	...	*2	.....	....
Teck Hughes	Toronto	*43	*31	*43	.....	....
Tom Reed	Los Angeles	....	....	*77	Dec. '19,	0.02
United Eastern	N. Y. Curb	2	1 1/16	1 1/16	Jan. '22, Q	0.15
Vindicator Consol	Colo. Springs	*22	*21	*21	Jan. '20, Q	0.01
White Caps Mining	N. Y. Curb	...	...	*3	.....	....
Yukon Gold	N. Y. Curb	1⅛	1 1/16	1 1/16	June '18,	0.02½
SILVER						
Batopilas Mining	New York	...	...	⅛	Dec. '07, I	0.12½
Beaver Consol	Toronto	*36	*27½	*35½	May '20, K	0.03
Coniagas	Totonto	1	1	1	May '21, Q	0.12½
Crown Reserve	Toronto	*25	*16½	*24	Jan. '17,	0.05
Kerr Lake	N. Y. Curb	3⅛	3⅛	3⅛	Jan. '22, Q	0.12½
La Rose	Toronto	*52	*38	*52	Apr. '18,	0.02
McKinley-Dar.-Sav	Toronto	*23	*15	*23	Oct. '20, Q	0.03
Mining Corp. Can	Toronto	1.15	1.00	1.15	Sept. '20, Q	0.12½
Nipissing	N. Y. Curb	6⅛	6	6⅛	Jan. '22, Q	0.15
Ontario Silver	New York	5⅛	5⅛	5⅛	Jan. '19, Q	0.50
Ophir Silver	N. Y. Curb	...	...	*12	Jan. '12,	0.10
Temiskaming	Toronto	*34	*33	*34	Jan. '20, K	0.04
Trethewey	Toronto	*5	*3½	*5	Jan. '19,	0.05
GOLD AND SILVER						
Boston & Montana	N. Y. Curb	*46	*40	*41	.....	....
Cash Boy	N. Y. Curb	*4	*4	*4	.....	....
Dolores Esperanza	N. Y. Curb	1	*75	*82	.....	....
El Salvador	N. Y. Curb	*5	*3	*4	.....	....
Jim Butler	N. Y. Curb	6	6	*6	Aug. '18, SA	0.07
Jumbo Extension	N. Y. Curb	4	3	*4	June '16,	0.05
MacNamara M.&M.	N. Y. Curb	*8	*7	*8	May '10,	0.02½
Tonopah Belmont	N. Y. Curb	1⅛	1⅛	1 1/16	Jan. '22, Q	0.05
Tonopah Divide	N. Y. Curb	*63	*58	*58	.....	....
Tonopah Extension	N. Y. Curb	1⅛	1⅛	1⅛	Jan. '22, Q	0.05
Tonopah Mining	N. Y. Curb	1⅛	1⅛	1⅛	Oct. '21, SA	0.05
West End Consol	N. Y. Curb	*75	*75	*75	Dec. '19, SA	0.05
SILVER-LEAD						
Caledonia	N. Y. Curb	...	...	*5	Jan. '21, M	0.01
Cardiff M. & M	Salt Lake	1.00	1.00	1.00	Dec. '20,	0.15
Chief Consol	Boston Curb	3⅛	3⅛	3⅛	Aug. '21, Q	0.05
Consol. M. & S	Montreal	19	18½	18½	Oct. '20, Q	0.62½
Daly Mining	Salt Lake	†3.00	†1.00	...	July '20, Q	0.10
Daly-West	Boston	2⅛	2⅛	2⅛	Dec. '20, Q	0.25
Eagle & Blue Bell	Boston Curb	†⅜	†2⅜	2⅜	Apr. '21, K	0.05
Electric Point	Spokane	*5	*4½	*4½	May '20, SA	0.03
Federal M. & S	New York	†12	†8	...	Jan. '09,	1.50
Federal M. & S., pfd	New York	39½	39	39	Dec. '21, Q	1.00
Florence Silver	Spokane	*22	*19½	*22	Apr. '19,	0.01½
Grand Central	Salt Lake	†*44½	†*42	*42	Jan. '21, K	0.01
Hecla Mining	N. Y. Curb	5⅜	5⅜	5⅜	Dec. '21, Q	0.17
Iron Blossom Con	N. Y. Curb	*19	*19	*19	Dec. '21, Q	0.02½
Judge M. & S	Salt Lake	†3.10	†2.50	3.00	Sept. '20, Q	0.12½
Marsh Mines	N. Y. Curb	*5	*5	*5	June '21, I	0.02
Prince Consol	Salt Lake	*8⅛	*7½	*8⅛	Nov. '17,	0.02½
Rambler-Cariboo	Spokane	*6½	*5½	*5½	Feb. '19,	0.01
Rex Consol	N. Y. Curb	*9	*7	*8	.....	....
South Hecla	Salt Lake	†*60	†*35	...	Sept. '19, K	0.15
Standard Silver-Ld	N. Y. Curb	*15	*15	*15	Oct. '17,	0.05
Stewart Mines	N. Y. Curb	*3	*3	*3	Dec. '15,	0.05
Tamarack-Custer	Spokane	2.25	2.00	2.25	Jan. '21, K	0.04
Tintic Standard	Salt Lake	2.12½	2.00	2.02	Dec. '21, Q	0.05
Utah Apex	Boston	3⅛	3	3⅛	Nov. '20, K	0.25
Wilbert Mining	N. Y. Curb	...	...	*2	Nov. '17,	0.01
VANADIUM						
Vanadium Corp	New York	38⅛	33⅞	36⅛	Jan. '21, Q	1.00
ASBESTOS						
Asbestos Corp	Montreal	48	47	48	Jan. '22, Q	1.50
Asbestos Corp., pfd	Montreal	...	...	74	Jan. '22, Q	1.75
SULPHUR						
Freeport, Texas	New York	14⅛	13⅜	14	Nov. '19, Q	1.00
Texas Gulf	New York	46⅛	43½	46½	Dec. '21, Q	1.00
MINING, SMELTING AND REFINING						
Amer. Sm. & Ref	New York	46⅞	45⅛	46⅛	Mar. '21, Q	1.00
Amer. Sm.& Ref. pf	New York	90⅛	89⅛	89⅛	Dec. '21, Q	1.75⅛
Am. Sm. Sec. pf. A	New York	88⅛	88⅛	88⅛	Jan. '22, Q	1.50
U. S. Sm. R. & M	New York	33⅛	33⅛	33⅛	Jan. '21, Q	0.50
U.S. Sm.R.& M. pf	New York	43	43	43	Jan. '22, Q	0.87

NEW MACHINERY AND INVENTIONS

The Summer Camp—A Welfare Provision

Welfare work is generally considered as confined principally to the larger industrial and mining enterprises. Its value in general business and mercantile firms is certainly just as important, but in this extensive field little has even been attempted.

The Hendrie & Bolthoff Manufacturing & Supply Co., of Denver, Col., has always maintained close and friendly

SUMMER CAMP OF HENDRIE & BOLTHOFF

relations with the company's 275 employees. To meet the problems of sickness and to promote entertainments and social relations, a mutual benefit association was established in 1903 with 75 charter members. The enrollment is purely voluntary, and has averaged over 90 per cent during the eighteen years. The association is self-governed by regularly elected officers and by various committees who visit the sick, administer relief, and also arrange for entertainments and other social gatherings.

The sick fund is maintained by assessments, the average cost to each member being about $4.50 per year. The firm itself contributes 50 per cent additional toward the fund. During sickness, a benefit of $10 per week is paid for a period of ten weeks if required. In cases of special emergency, this can be extended for another ten weeks.

The firm, at its own expense, also carries group life insurance, which covers all who have been in its employ for a year. This pays $1,000 to the family of a married man, $500 to the beneficiary of a single male, and $500 to any woman employee's beneficiary.

The most interesting branch of the firm's welfare work is the mountain recreation camp. Summer vacations for the average working man with a wife and children do not mean a trip to some cool resort and a week or two at a good hotel with the usual recreations and sports. The railroad fare is often the deciding factor against it, to say nothing of the cost of board during the outing. So he generally spends the period restlessly at home and is glad when the time is up to go back to work. The wife and children get no change whatever.

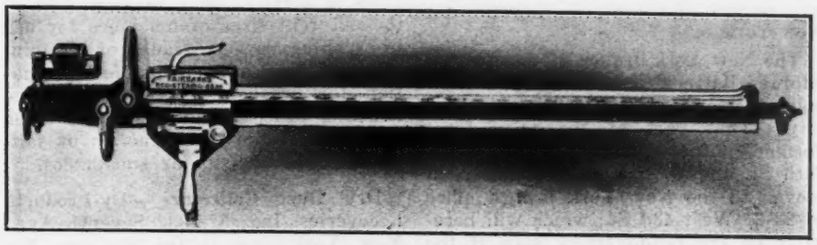
It was to provide the means of enjoying a real vacation that the Hendrie & Bolthoff Manufacturing & Supply Co. purchased a former summer resort, comprising 80 acres of mountain land beautifully situated on the South Platte River about thirty-two miles from Denver. Summer rates on the C. & S. Ry. make the transportation costs reasonable. There is a good automobile road for those who prefer the trusty flivver.

The water supply is piped from a small mountain stream for a quarter of a mile and provides ample fresh cold water under good pressure.

There were six cottages on the property, well situated but in poor repair. These have been rebuilt, new floors put in, and wide porches added. There is running water in the kitchens and every comfort and convenience appropriate for the purpose is to be found. In addition, the cottages are completely furnished, even to blankets and cooking utensils, only bed and table linen being excepted. Accommodation is provided for seven families each week, the larger cottages being allotted to those with the largest families. The firm makes no charge for the cottages. Even the fuel is supplied, so that the cost of food and railway fare is the only expense to those who take advantage of this unusual opportunity for a real summer vacation.

Type-Registering Scales

Inquiry has been made as to what manufacturer supplies a type-registering beam scale described in the article, "Gold Mining at Carson Hill, California," appearing in *Engineering and Mining Journal*, Nov. 5, 1921, p. 727. Fairbanks, Morse & Co. manufacture the track scales used at the Carson Hill mine. In this type of scales the single beam is fitted with a metal type-strip and a printing mechanism which is part of the poise itself. The poise runs on smooth-turned rollers upon the milled top of the beam, the back roller having a groove corresponding to a rib milled on the beam which prevents the poise from sticking or jumping off. The poise has a handle at the top, the end of which engages with notches on the beam, so that the poise must always rest over a graduation and not between two graduations. A fractional poise is operated by a knurled handle on the front of the main poise. The face of the beam is beveled for convenience in reading. The type-registering ticket is placed in a slot in the poise. The printing plunger is operated by a handle in conjunction with a stationary hand-hold attached to the front of the poise. This obviates twisting the beam on its hangers. A slide on the poise allows for gross and tare weights. Tickets of standard size are available, and the device is of utility in preventing blunders in writing down weights.



TYPE-REGISTERING BEAM SCALE

New Dynamite Claims Several Advantages

A dynamite which, it is announced, will prove an important factor in reducing explosives costs in quarrying and other open-cut work has been perfected recently. The new "powder" is known as "dumorite" and is made with a double base of modified nitroglycerin and guncotton. It cannot freeze and does not produce headache. It is claimed that the explosive will effect a saving in cost of one-third. It is as powerful, stick for stick, under ordinary conditions, as regular 40 per cent dynamite, its economy consisting in the fact that each case contains approximately one-third more sticks. The new dynamite is being produced by the Du Pont company.

When "Free as Air" Loses Its Meaning

Air when compressed and converted into a form of energy and power ceases to be "free"; fuel, machinery, equipment, and labor enter into making it an item of cost. And cost of compressed air rises greatly through any waste by leakage before final distribution to the tool which it operates or to the points of its ultimate use. Owing to leakage through joints in piping, valves, split pipe, defective castings, and wastage at a tool or machine, the over-all efficiency of compressed air is often reduced 40 to 60 per cent throughout the system.

Jenkins Bros., manufacturers of Jenkins valves, have recently perfected and are now marketing a brass air gun, which is air-tight and an assurance against costly air waste. The Jenkins renewable disk with which this

air gun is fitted is an innovation in equipment of this kind, and is especially suited for air service. The disk forms a perfect contact on the seat and takes up the wear of frequent usage. It gives long service, but can be easily and quickly renewed, if necessary.

The Jenkins air gun is finding wide use in foundries for blowing off cores, cleaning core boxes, flasks, patterns, and for general dusting and in machine shops for blowing off chip boring filings, trimmings, and for cleaning tools, tops, dies; in fact everywhere that a blast of air is required.

INDUSTRIAL NOTES

The Hercules Powder Co. has reduced prices on high-explosives, permissibles and blasting powders. The new prices, effective Feb. 17, will be quoted on request.

C. L. Dewey has become associated with the Cement-Gun Construction Co. of Chicago, Ill. He will devote his time exclusively to the development of "cement-gun" contract work.

The Philadelphia office of the Hauck Manufacturing Co. has been moved to 1726 Sansom St. Herbert Vogelsang, who has been connected with the company for six years, will be in charge.

Wilson Welder & Metals Co., Inc., 132 King St., New York, manufacturer of arc welding machines and certified welding metals, announces the appointment of R. L. White as district manager in charge of the company's Detroit office, at 809 Kresge Building, Detroit, Mich.

The Rathbun Jones Engineering Co., Toledo, Ohio, has appointed the Ingersoll-Rand Co., New York, general sales agent for Rathbun gas engines. The large sales organization and service department of the Ingersoll-Rand Co., combined with the fact that gas engines are used to drive compressors, pumps, and other machinery which it manufactures, places it in a position to serve with satisfaction the users of gas engines and other complementary machinery.

The Chillingworth Engineering Corporation announces that Frank H. Plum, Herbert Pluemer, George E. Mellin, and Harold von Thaden, formerly of the C. W. Hunt Engineering Corporation, have become associated with the Chillingworth interests and will carry on a business of a character similar to that conducted by the C. W. Hunt Engineering Corporation. The corporation will occupy offices at 143 Liberty St., New York.

The New York branch of the Electric Storage Battery Co. announces the consolidation of its various offices in that city. That part of the sales force formerly situated at the Exide factory, 64th St. and West End Ave., has been moved to the New York branch office at 23-31 West 43d St., which will hereafter be the headquarters also of the export sales department. F. L. Kellogg, manager of the North Atlantic district; F. F. Sampson, New York branch manager; and J. F. Kelly, Jr., export sales manager, will make their headquarters at the West 43d St. offices.

The East Butte Copper Mining Co. has just purchased an 8-ft. by 30-in. Hardinge conical ball mill for the company's flotation plant at the Silver Plume mine, in Colorado. The Mazapil Copper Co. at Saltillo, Mexico, has just purchased a 6-ft. x 22-in. Hardinge ball mill to grind a copper ore, also for flotation. The Pittsburgh Exploration Syndicate has bought a 3-ft. ball mill for its plant in Nicaragua. The Atlas Mining & Milling Co. of Sneffels, Col., has bought a 7-ft. x 36-in. Hardinge conical ball mill for the recovery of silver from the company's ore by flotation. The Oceona Development Co. of Arivaca, Ariz., has purchased two 4½-ft. x 16-in. Hardinge conical ball mills to be used to grind for flotation.

TRADE CATALOGS

Manganiferous Iron Ores—Clement K. Quinn & Co., Duluth, Minn., and Cleveland, Ohio, have recently issued an instructive little bulletin which contains interesting facts regarding the uses and effects of manganiferous iron ores as used in blast-furnace practice.

Oil Burners—The Denver Fire Clay Co., Denver, Col., has issued a new bulletin of thirty-two pages, "D. F. C. Oil Burners," which deals with the types of burners and equipment manufactured by the company. The first twenty-one pages are devoted to a general discussion on the combustion of fuel oil. The company will send a copy to those interested.

Mesabi Sinter—Clement K. Quinn & Co., Kirby Building, Cleveland, Ohio, has recently issued a leaflet which describes briefly the features and advantages of "Mesabi Sinter," in addition to interesting facts regarding its manufacture. This sinter, or manufactured iron ore, is being produced on the eastern end of the Mesabi Range by the Mesabi Iron Co. Clement K. Quinn & Co. are the exclusive sales agents.

Coal Crushers — The Jeffery Manufacturing Co., Columbus, Ohio, has recently issued Catalog No. 3559, which illustrates and describes the construction and operation of the Jeffery Single Roll crusher, including typical installations in service, table of capacities of the different sizes of machines for use in crushing various grades of bituminous coal, and other valuable information for crusher users. Besides the crushing of coal, this type of crusher is well suited to the reduction of salt, alum, bone, and similar substances.

Dry Dust Collectors — By-Products Recoveries, Inc., 328-332 Seventh Ave., New York, has issued Bulletin No. 326, descriptive of the reverse-nozzle type of dry dust collectors which the company is manufacturing. This collector consists of a chamber containing a multiplicity of perforated baffles with a unique circulating system which causes them to function to the best advantage. It may also be used as a classifier, as the coarser particles are recovered in the first sections of the receiving bin. No provision is considered necessary for cleaning.

Dorr Equipment—The Dorr Co., 101 Park Ave., New York, has issued an attractive pamphlet, printed in sepia on tinted paper and tied with a silk cord, describing the testing facilities of the company. These are unique, as many of our readers know, for the company maintains a complete plant at Westport, Conn., at the junction of the Saugatuck and Aspetuck rivers, where the natural environment as well as the man-made equipment is most conducive to scientific research. The Dorr pulp-handling and settling apparatus has almost unlimited applications where the handling of mixtures of finely divided solids and liquids in large quantities is involved.

Pulverized Fuel—A bulletin on the Quigley fuel systems, comprising methods of preparing, transporting, and burning of pulverized fuels, has been issued by the Hardinge Co., 120 Broadway, New York. This bulletin is known as No. 12, and treats the subject of pulverized fuels in a manner never before attempted. One of its distinguishing features is the fact that emphasis is laid upon the methods employed properly to prepare and burn the powdered coal, rather than on a discussion of the pulverizer. This catalog will undoubtedly be useful to the engineer designing power plants or furnaces requiring considerable quantities of heat, as facts and figures are given which will aid him in his work. At the same time, it is written in a way that will interest the non-technical person who is seeking a general knowledge of the subject covered.

Pumps—With the intention of encouraging suitable standards of manufacture and of engineering practice in the pump industry, and assisting in the development of standard methods of procedure, the Hydraulic Society, C. H. Rohrbach, secretary, 50 Church St., New York, has recently issued a nineteen-page bulletin, "Trade Standards in the Pump Industry." These standards consist of a number of recommendations and suggestions which are offered as a guide for buyers and sellers. The work explains what is meant by trade pumps, plain fitted pumps, or brass fitted pumps; what is considered standard equipment for a trade pump and what the manufacturer considers as extras; typical sizes of trade pumps are shown; and definitions are given of terms used in the industry, such as static head, total dynamic head, suction lift, static suction lift, dynamic suction lift, and other nomenclature.